

ICHTHYOLOGICAL DESCRIPTIONS AND NOTES.

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(Twelve Text-figures.)

[Read 25th August, 1943.]

This paper includes descriptions of new or little-known genera and species, notes on synonymy, range and variation of about thirty different Australian sharks, rays and fishes. Illustrations are provided of a number of authentic type-specimens, some of them in overseas collections not now accessible. Some of the material was first studied from the living specimens, especially in the case of the sharks, which are bulky animals which can be better compared in the field than in museum or laboratory. As sharks are increasing in commercial importance in Australia, the species must be critically determined before a scientific survey of the fishery can be made. Similarly, the Hardyheads or Atherinidae may prove substitutes for canned fish no longer imported, or be available as live bait for catching larger commercial fishes; so a classification of the nominal Australian species is here attempted as a preliminary to more detailed revision.

The author gratefully acknowledges facilities afforded by the authorities of the museums mentioned in the text and the assistance rendered by fisheries inspectors and fishermen during field work.

Biometric Measurements.

I have devised a set of standard measurements for comparative and biometric studies of Australian sharks. The shark being measured is placed as straight as possible on a horizontal axis, and measurements are taken between parallels by means of dividers. A form is filled in for each specimen, giving, whenever possible, its name, locality, date and means of capture, serial number, sex, total length, weight and colour; the condition, size and weight of the liver, gonads and stomach contents are noted; embryos are measured and their sex-ratio and size of yolk-sacs noted. The biometric measurements and their symbols are detailed hereunder so that they may be quoted henceforth in abbreviated form to save space.

Head Measurements.

- H.1. Length of head to first gill-slit.
- H.2. Length of head to last gill-slit.
- H.3. Tip of snout to anterior margin of eye.
- H.4. Breadth of snout immediately before eyes.
- H.5. Snout to origin of pectorals.
- H.6. Snout to origin of ventrals.
- H.7. Eye—horizontal diameter.
- H.8. Eye—vertical diameter (outside nictitating membrane).
- H.9. Interorbital.
- H.10. Eye to spiracle.
- H.11. Length of nostril.
- H.12. Internarial, between posterior angles.
- H.13. Preoral length.
- H.14. Width of mouth (distance between angles).
- H.15. Labial fold—upper.

- H.16. Labial fold—lower.
 H.17. Height of first gill-opening.
 H.18. Height of last gill-opening.

Body Measurements.

- B.1. Length, snout to upper caudal pit or root.
 B.2. Length, snout to vent (middle).
 B.3. Predorsal length.
 B.4. Depth at origin of first dorsal.
 B.5. Breadth below origin of first dorsal.
 B.6. Depth of caudal peduncle (immediately before pit, if present).
 B.7. Breadth of caudal peduncle (immediately before pit, if present).
 B.8. Claspers—outer margin.
 B.9. Claspers—inner margin to membrane at base.

Fins.

- F.1. First dorsal: anterior margin, including spine, if present.
 F.2. First dorsal: base, including that of spine, if present.
 F.3. First dorsal: last ray.
 F.4. Interdorsal space.
 F.5. Second dorsal: anterior margin.
 F.6. Second dorsal: base.
 F.7. Second dorsal: last ray.
 F.8. Second dorsal to caudal pit (or base).
 F.9. Anal fin: anterior margin.
 F.10. Anal fin: base.
 F.11. Anal fin: last ray.
 F.12. Anal base to caudal pit (or base).
 F.13. Relative positions of second dorsal and anal (shown by a sketch).
 F.14. Pectoral: length.
 F.15. Pectoral: base.
 F.16. Origin of pectoral to that of ventral.
 F.17. Ventral fin: length of anterior margin.
 F.18. Ventral fin: base (when clasper present, to outer angle of clasper).
 F.19. Ventral fin: length of last ray, measured externally (superiorly).
 F.20. Ventral origin to anal origin.
 F.21. Caudal (measured from pit, if present): upper lobe.
 F.22. Caudal (measured from pit, if present): lower lobe.

Family GALEIDAE.

URANGA, n. gen.

Orthotype, *Uranga nasuta*, n. sp.

A small, long-snouted Galeid shark of the *Longmania-Hypoprion-Galeolamna* series, with characteristic dentition as described hereunder.

Snout long, acute. Eye with nictitating membrane. Interorbital convex. No spiracle.

Body elongate fusiform. Caudal pits present. First dorsal nearer pectorals than ventrals. Second dorsal fin subequal to anal, its origins slightly behind levels of anal origins.

Longmania differs in having the teeth not serrated, has first dorsal fin as high as long, and has differently formed labial folds, also the second dorsal fin is smaller than the anal. *Hypoprion* has more pointed teeth, in fewer numbers, and has three small symphyseal series in upper jaw. *Galeolamna* has teeth similar in form to the new shark's, but has less elongate snout, different relative positions of second dorsal and anal fins.

URANGA NASUTA, n. sp. Fig. 1.

Eastern Sand Shark.

General characters as defined for genus.

Teeth of upper jaw compressed, only slightly deflected outwards, each with a long acute central cusp, the bases flaring out from the notch on each side; both base and cusp are serrated, the serrae are mostly weak, but are largest on outer slopes of bases.

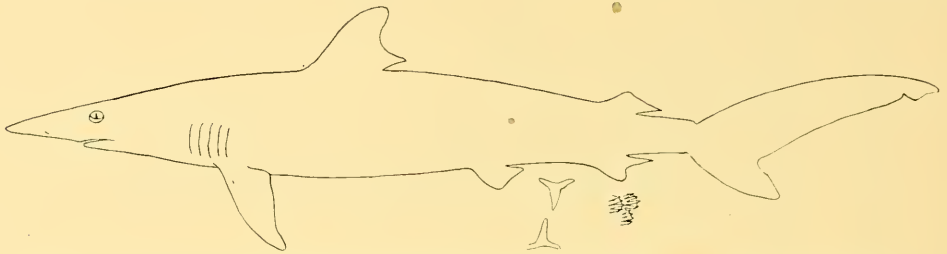


Fig. 1.—*Urange nasuta* Whitley. Holotype from Urangan, Queensland. Lateral view, upper and lower teeth, and dermal denticles.

No symphyseal teeth. Six or seven rows of teeth from front to back. Teeth of lower jaw in five or six rows, similar to those of upper, but with rather longer and more slender fangs and serrae obsolete. Symphyseal row of teeth smaller than those on each side. In the upper jaw, the base of a tooth is slightly more, in the lower much more, than its height; bases not swollen.

$$\text{Dental formula: } \frac{18. 16}{16. 1. 16} = \frac{34}{33}.$$

Pores on head inconspicuous.

Third gill-slit longest. Last two gill-slits over pectoral.

Dermal denticles fine, small, close-set, with four longitudinal carinae extending to spines at edges.

No interdorsal ridge. Lateral line inconspicuous.

First dorsal fin longer than high.

Following are the principal dimensions of the holotype in millimetres:

Head to first gill-slit, 147.

Head to fifth gill-slit, 178.

Gill-slits: i, 25.5; ii, 27; iii, 28;
iv, 27; and v, 21.

Snout to anterior margin of eye, 67.

Breadth of snout before eyes, 62.

Diameters of eye, 12 by 6.

Interorbital, 64.

Nostril, 9.

Internarial, 35.

Preoral length, 61.

Width of mouth, 49.

Upper and lower labial folds, 5.5
and 5.

Predorsal length, 248.

Depth at origin of first dorsal, 86.

First dorsal fin: anterior margin, 75.

First dorsal fin: base, 65.

First dorsal fin: lobe, 21.

Interdorsal space, 166.

Second dorsal fin: anterior margin,
26.

Second dorsal fin: base, 26.

Second dorsal fin: lobe, 21.

Distance from second dorsal to
caudal pit, 46.

Anal fin: anterior margin, 36.

Anal fin: base, 32.5.

Anal fin: lobe, 24.

Anal base to caudal pit, 48.

Pectoral: length, 91.

Pectoral: base, 35.

Ventral: anterior margin, 29.

Ventral: base, 29.

Ventral: lobe, 16.

Caudal: upper lobe, 200.

Caudal: lower lobe, 80.

Pectoral origin to ventral origin,
206.

Ventral origin to anal origin, 88.

Snout to umbilical scar, 162.

Snout to upper caudal pit, 529.

Snout to vent, 380.

The stomach contained a Whiting (*Sillago*).

Colour light grey above, white on breast. Eye bluish, pupil a vertical dark slit.

Described and figured from the holotype of the species, an immature female. 727 mm. or 2 ft. 5 in. long, in which the umbilical scar is persistent. Weight 3¾ lb. Australian Museum Regd. No. IB.1222.

Teeth and denticles preserved and drawn here, enlarged; view of shark reconstructed from measurements and field notes.

Locality.—Urangan, Hervey Bay, Queensland; caught off jetty, 16th March, 1943.

Genus *GALEOLAMNA* Owen, 1853.

URANGANOPS, n. subgen.

Orthotype, *Galeolamna (Uranganops) fitzroyensis*, n. sp.

A Whaler Shark with long, acute snout and nostrils more transversely situated than in other species. Eye with nictitating membrane. No spiracle. Teeth of upper jaw with acute central cusp, notched and serrated; of lower jaw, slender and entire (described in detail hereunder). Thirty teeth in each jaw. Anterior profile of back moderately gibbous. Preanal length longer than postanal. No interdorsal ridge. Denticles tricarinate. Anterior margin of second dorsal fin trenchant. Second dorsal and anal fins well developed, the latter the larger. Inner pectoral angle in advance of level of first dorsal.

Colour bronze to greyish-blue above, whitish below.

Other details as described and figured for species hereunder.

Differs from *Galeolamna* (type, *greyi*) mainly in having long, acute snout, very different teeth; from *Galeolamnoides* (type, *macrurus*) in having entire lower jaw teeth, in lacking interdorsal ridge; from *Ogilamia* (type, *stevensi*) in having longer snout, in having trenchant second dorsal margin, notched teeth; from a new subgenus to be defined later (type, *spenceri*) in form of snout, more teeth, and of different form; from *Uranga* in teeth, dorsal smaller than anal, narrower gill-slits.

GALEOLAMNA (URANGANOPS) FITZROYENSIS, n. sp. Fig. 2.

Creek Whaler.

Snout acute, the preoral length (101 mm.) little more than width of mouth (103). Anterior profile sloping gently upwards, not very gibbous over gills. Nostrils more transverse than in other species, with small flaps, much nearer mouth than tip of snout. Interorbital gently convex.

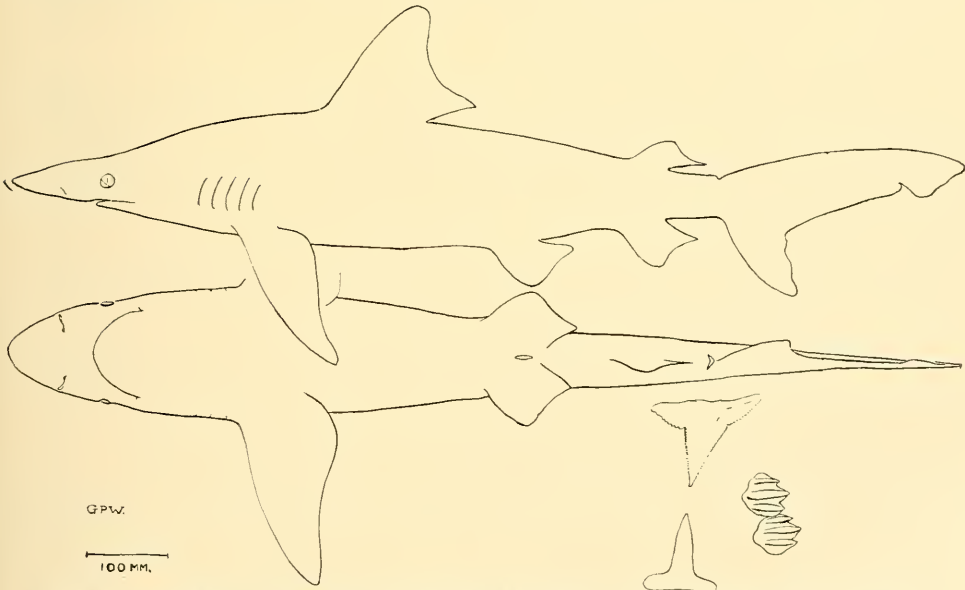


Fig. 2.—*Galeolamna (Uranganops) fitzroyensis* Whitley. Holotype from Fitzroy River, Queensland. Lateral and ventral views, teeth and denticles.

Teeth in upper jaw compressed, the central ones suberect, the lateral ones deflected outwards with wide, acute, central cusp, slightly notched on inner and strongly on outer side, where the basal part of each tooth has four to six strong serrae; bases

and cusps of teeth serrated almost to tip. Two (alternating) symphyseal teeth (see figure). Teeth of lower jaw erect, much smaller and slenderer than those of upper; quite entire; base subequal to height. Tooth on each side of symphysis smaller than its neighbours and with flared inner shoulders.

$$\text{Dental formula: } \frac{14. 2. 14}{15. 15} = \frac{30}{30}$$

Fourth and fifth gill-slits over pectoral. Third gill-slit longest.

Biometrics (mm.).

Total length	..	1174	H.13	..	..	101	B. 7	..	..	42	F.10	..	..	61
H. 1	..	236	14	..	..	103	8	..	..	—	11	..	..	45
2	..	299	15	..	..	6	9	..	..	—	12	..	..	65
3	..	109	16	..	..	3					13	..	(vide descr.)	
4	..	114	17	..	..	33	F. 1	..	..	182	14	..	..	223
5	..	267	18	..	..	30	2	..	..	128	15	..	..	77
6	..	588					3	..	..	60	16	..	..	323
7	..	16	B. 1	..	..	862	4	..	..	250	17	..	..	89
8	..	16	2	..	..	628	5	..	..	63	18	..	..	71
9	..	111	3	..	..	396	6	..	..	505	19	..	..	46
10	..	(no spiracle)	4	..	..	176	7	..	..	48	20	..	..	151
11	..	21	5	..	..	140	8	..	..	80	21	..	..	311
12	..	56	6	..	..	48	9	..	..	71	22	..	..	136

General dimensions as listed in biometric tables above, from which (and the diagrams) proportions can be worked out.

Some additional dimensions are:

Nostril to tip of snout, 71 mm.; to eye, 40; to corner of mouth, 88 (equal to distance between outer angles of nostrils). Ramal length of jaw, 71. Eye to first gill-opening, 122; to last, 183. Second to fourth gills about 38. Distances between gill-slits: 20, 15, 14 and 13. Snout to median level of pectoral origins, 283. Distance between pectorals anteriorly, 178, and posteriorly, 95. Width of back over ventral origins, 96. Distance between ventral origins, 81.

Body fairly elongate, greatest width of shark (161.5) is at fifth gill-slit. Aquaeductus vestibuli and lateral line system inconspicuous. Postanal length less than preanal length.

Denticles below anterior dorsal fin small, close-set, tricarinate or occasionally with four keels.

Caudal pits present. No caudal keel.

Form and positions of fins as illustrated. First dorsal nearer pectorals than ventrals, its origin 475 mm. from upper caudal pit and 303 from eye. Second dorsal and anal larger than in most whaler sharks. Anterior margin of second dorsal trenchant, not flattened. Anal origin ahead of second dorsal's, anal's end behind that of second dorsal. Pectoral extending to slightly behind end of first dorsal base (not to end of its lobe). Inner pectoral angle in advance of level of origin of first dorsal fin. Pectoral slightly longer than postorbital part of head.

Colour bronze when fresh, fading overnight to pale grey-blue on upper surface; under surface whitish. Fins greyish, without any black tips. Eye greyish, speckled with darker. Dorsal axils grey, white inside.

Liver, dark and mottled, 13½ oz. Gonad weight, 3 oz. Ova, up to 8 mm. diameter, forming. Mucus and cysts in uteri. No embryos. Stomach contained remains of prawn and unidentifiable fish.

Described and figured from unique female holotype, 1174 mm. or 47 in. long; weight, 21½ lb. Australian Museum Regd. No. IB.1229. Teeth and denticles preserved.

Original sketches and drawings and photographs by G. Jorgenson and W. Jacobson. "Grey Nurse" (a misnomer) of the fishermen. I suggest Creek Whaler as a vernacular name.

Locality.—Connor's Creek, Fitzroy River estuary, Rockhampton district, Queensland; 22nd March, 1943; hooked on fish bait at 9.35 p.m. and attacked by a Sea Snake which bit the shark's head as it was hauled in. A second female specimen, 29¼ in. long, is in the Australian Museum from St. Crispin Reef, off Port Douglas, Queensland; coll. A. R. McCulloch, 1918. (Regd. No. I.14569.)

Affinities: Apparently near the Bronze Whaler (*G. ahenea*), but differing in dental features, as follows (the two holotypes compared directly):

- A. Inner shoulder of each tooth in upper jaw steeply sloping, thus inner notch very slight and very obtuse-angled. Inner margin of central cusp straight and long. Lower jaw teeth entire *fitzroyensis*, n. sp.
- AA. Inner shoulder of each tooth in upper jaw flared out more broadly, thus inner notch deeper and less obtuse. Inner margin of central cusp convex and shorter. Lower jaw teeth serrated *ahenea*

LAMNARIUS, n. subgen.

Orthotype, *Carcharias spenceri*. Ogilby, 1910, as identified here.

Preoral length* 1.2 to 1.5 in width of mouth. Snout bluntly rounded. No spiracle. Second or third gill-slit longest, twice diameter of eye.

Teeth serrated in both jaws. Upper teeth scarcely notched or deflected. Lower erect. Labial folds short. Thirteen or less teeth on each side of symphyseal tooth in each jaw.

No interdorsal ridge. Form robust. Vent near, or slightly behind, middle of length. Dermal denticles very small, not close-set, with three to five carinae.

second dorsal trenchant. Inner angle of pectoral below or slightly ahead of level of first dorsal origin. Pectoral extends nearly to below end of first dorsal base.

Colour bluish. Tips of fins blackish.

Estuaries and rivers of Queensland and northern New South Wales.

GALEOLAMNA (LAMNARIUS) SPENCERI (Ogilby, 1910). Fig. 3.

Estuary Shark. "Blue Shark" of Rockhampton and Brisbane districts.

Carcharias brachyurus Waite, *Rec. Aust. Mus.*, vi (3), 1906, p. 226, pl. xxxix (not of Gunther).

Carcharias spenceri Ogilby, *Proc. Roy. Soc. Qd.*, xxiii, 1910, p. 3. Brisbane River, Queensland. Type not extant.

Galeolamna spenceri Whitley, *Fish. Aust.*, i, 1940, p. 102, fig. 98; and as *G. (Ogilamia) stevensi*. *Ibid.*, p. 104, fig. 99 (New South Wales record and figure only, not text).

The species now identified as *spenceri* was figured as *Carcharias brachyurus* by Waite (loc. cit., 1906), though it disagreed in several respects from Gunther's true *brachyurus*

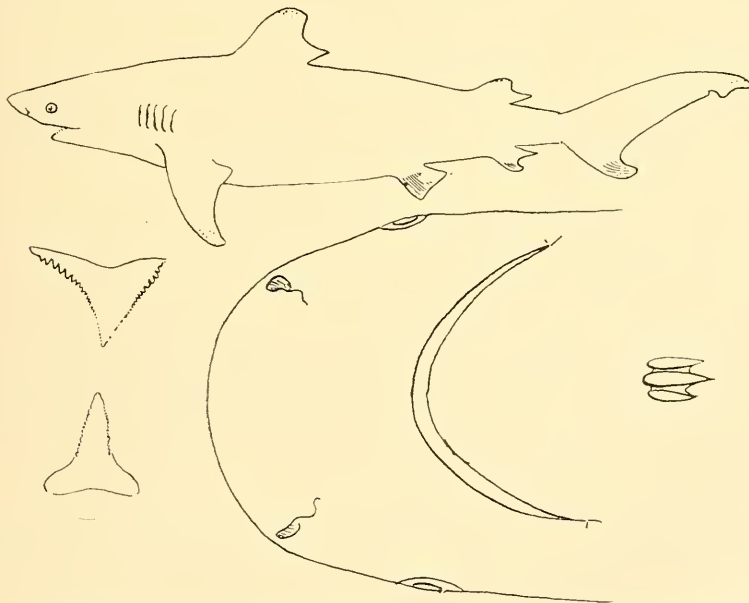


Fig. 3.—*Galeolamna (Lamnarius) spenceri* (Ogilby). A specimen from Lake Macquarie, New South Wales (mod. after Waite). Teeth, ventral surface of head and denticle.

* It is noteworthy that Ogilby calls the preoral length the "snout" in his descriptions; other authors (the writer included) regard the length of the snout as being the distance from tip of snout ("nose") to anterior margin of eye.

from New Zealand. Waite's specimen, which came from Lake Macquarie, New South Wales, is still in the Australian Museum (Regd. No. I.7586) and may be considered as pleisotype of the species, which was not named when Waite published his figure. Both the late A. R. McCulloch (in MS.) and the writer considered that Waite's example was *stevensi* Ogilby, but neither of us could be sure because it did not exactly agree with Ogilby's description, and moreover, types of neither *stevensi* nor *spenceri* had been preserved. In Queensland, in March, 1943, the present writer made detailed notes on all Whaler Sharks caught, bearing in mind these little-known species of Ogilby, and his present determinations, having been arrived at after most searching comparison, are believed to be correct.

Descriptive notes of several specimens of *spenceri* are given below:

- A. Waite's '*brachyurus*', a gutted female, 828 mm. long, from Lake Macquarie, New South Wales. Australian Museum Regd. No. I.7586. About December, 1905–New Year, 1906.
- B. An immature female, 732 mm. long, from Mackenzie Island, Fitzroy River, Queensland. 19.iii.43. Australian Museum Regd. No. IB.1221. Weight 7 lb.
- C. A male. 791 mm., from near Sea Hill, Curtis Island, Queensland. 21.iii.43. Weight 7½ lb. Not preserved.
- D. An immature male, 804 mm., from Broadwater, Fitzroy River estuary, Queensland. 22.iii.43. Weight 8 lb. Not preserved.
- E. An immature female, 734 mm. Weight 8 lb.; same data as D.

Specimen A.

General form, relative positions of fins, and proportions as figured by Waite. Measurements as in tables of biometrics, *infra*. Head 4.3 in total length (828 mm.).

Teeth not strongly compressed. Upper ones subtriangular, coarsely serrated, the serrations largest along shoulders; hardly notched and very slightly deflected, thirteen each side of symphyssial tooth. Lower teeth narrower, erect, serrated on cusp; base broad. Symphyssial tooth not much smaller than the ten or so on either side of it. Velum maxillare and palate papillated.

Eye to first gill-opening, 86 mm.; to fifth, 124. Second gill-slit longest, 28 mm., twice diameter of eye.

Length behind vent slightly less than head plus trunk. No interdorsal ridge. Denticles tricarinate. Origin of first dorsal over inner pectoral angle. Anterior margin of second dorsal trenchant. Pectoral extends nearly to below end of first dorsal base.

Specimen B.

Very similar in facies to Waite's figure (Specimen A above), but first dorsal fin slightly higher, agreeing in this respect with Specimens C to E. Snout bluntly rounded. Nasal flaps conspicuous, rounded. No spiracle.

Teeth in upper jaw compressed, sub-triangular, very slightly deflected laterally, convex on inner and concave on outer edges, not notched. Teeth coarsely serrated to tip, the serrae largest towards base. A small symphyssial tooth. Teeth of lower jaw erect, more acutely angled, smaller towards symphysis, completely serrated to their tips, their base is more than their height. A small, acute, serrated symphyssial tooth.

$$\text{Dental formula: } \frac{13.1.13}{11.1.11 + 1 \text{ rudiment}} = \frac{27}{23}$$

Lower labial fold a small notch.

Eye to first gill-slit, 74 mm. Second gill-slit longest (24 mm.). Biometrics in table. Form robust. No interdorsal ridge. Anterior dorsal profile ascending obliquely.

Dermal denticles very small, not as close-set or imbricate as in many sharks, with three to five carinae.

Length behind vent (364 mm.) nearly equals rest of shark.

Origin and end of anal base in advance of those of second dorsal. Pectoral longer than interspace between eye and last gill-opening. Inner angle of pectoral below origin of first dorsal.

Colour pale blue above, white below, all fins with dusky grey tips and anterior margins. Eye pale bronze with grey outer ring. Axils of dorsals white.

Liver weight 8 oz. Immature female, gonads weighing less than 1 oz., no eggs visible. A small quantity of digested fish-remains in stomach.

Specimen C.

Dental formula: $\frac{12.1.12}{12.1.11}$.

A slight gibbosity predorsally. No interdorsal ridge. Biometrics as tabled. Length behind vent, 392 mm. Origin and end of anal base behind levels of those of second dorsal.

Colour similar to Specimen B, but anal fin white.

Liver weight 3 oz. Testis 198 mm. long, pale pinkish brown; weight $\frac{1}{2}$ oz. No milt. Remains of one small fish in stomach.

Specimen D.

Dental formula: $\frac{12.1.12}{11.1.12}$.

Eye to last gill-slit, 126 mm. Second gill-slit longest. Length behind vent, 401. No interdorsal ridge. Origin and end of anal base behind levels of those of second dorsal.

Colour as in specimen C, anal fin white with small dusky mark at tip.

Liver nearly 3 oz., gall-bladder large. Testes about length of body-cavity, 310 mm., but too small to weigh. No milt in testes or seminal vesicles. Specimen immature. Stomach empty.

Specimen E.

Dental formula: $\frac{12.1.12}{11.1.11}$.

Origins of second dorsal and anal fins opposite, but anal has a longer base, so ends behind level of second dorsal end.

Liver weight 12 oz. Immature female, with no eggs or embryos, uteri mere threads; gonad weight negligible. Stomach empty.

Biometric Tables.

(All dimensions in millimetres.)

Specimen	..	A.	B.	C.	D.	E.	Specimen	..	A.	B.	C.	D.	E.
Locality	..	N.S.W.	Q.	Q.	Q.	Q.	Locality	..	N.S.W.	Q.	Q.	Q.	Q.
Sex	..	♀	♀	♂	♂	♀	Sex	..	♀	♀	♂	♂	♀
Total length	..	828	732	791	804	732							
Weight (lb.)	..	—	7	7 $\frac{1}{2}$	8	8	B. 6	..	35	33	32	34	32
H. 1	..	159	139	158	167	147	7	..	33	30	28	29	32
2	..	192	159.5	184	198	182	8	..	—	—	18.5	17	—
3	..	73	67	72	77	69	9	..	—	—	14	14	—
4	..	91	88	95	99	88.5							
5	..	185	165	186	190	177	F. 1	..	108	103	128	125	110
6	..	437	342	380	387	372	2	..	96	80	90	92	83
7	..	14	14	13	14	13	3	..	27	30.5	31	37	30
8	..	11	13.5	15	15	14	4	..	191	148	163	167	166
9	..	91	89	100	100	90	5	..	38	35	32.5	32	30
10 nil (no spiracle)	..	—	—	—	—	—	6	..	38	35	32.5	35	30
11	..	13	15	17	18	15	7	..	25	26	26	27	29
12	..	52	48	53	57	51.5	8	..	61	52.5	56	56	54
13	..	53	56	60	64	56	9	..	49	36	42	51	45
14	..	72	72	86	82	84	10	..	41	30	32	38	34
15	..	2	3	4	5	3	11	..	24	24	23	24	23
16 (a mere notch)	..	4	3	3	4	4	12	..	49.5	46	45	45	44
17	..	25	20	21	22	20	13	..	(See descriptions, above.)				
18	..	22	13	18	17	18	14	..	141	130	152	156	136
							15	..	52	53.5	55	54	52
							16	..	254	193	208	220	203
							17	..	49	44.5	46	53	45
B. 1	..	621	512	547	560	522	18	..	46	45	50	47	42
2	..	460	380	411	418	391	19	..	22	20	20	26	27
3	..	255	206	226	240	217	20	..	110	94	104	107	88
4	..	130	113	120	120	137	21	..	208	229	239	247	227
5	..	87?	95	100	110	115	22	..	97	93	105	110	94

Subgenus OGIAMIA Whitley, 1939.

GALEOLAMNA (OGIAMIA) STEVENSII (Ogilby, 1911). Fig. 4.

A large greyish Whaler with the characteristics of the subgenus *Ogilamia*, which are:

Snout bluntly rounded, nostrils oblique. Teeth serrated in both jaws, upper teeth scarcely notched. Lower jaw teeth thick from front to back at base, lanceolate. About 30 teeth in jaws. Interdorsal ridge present.

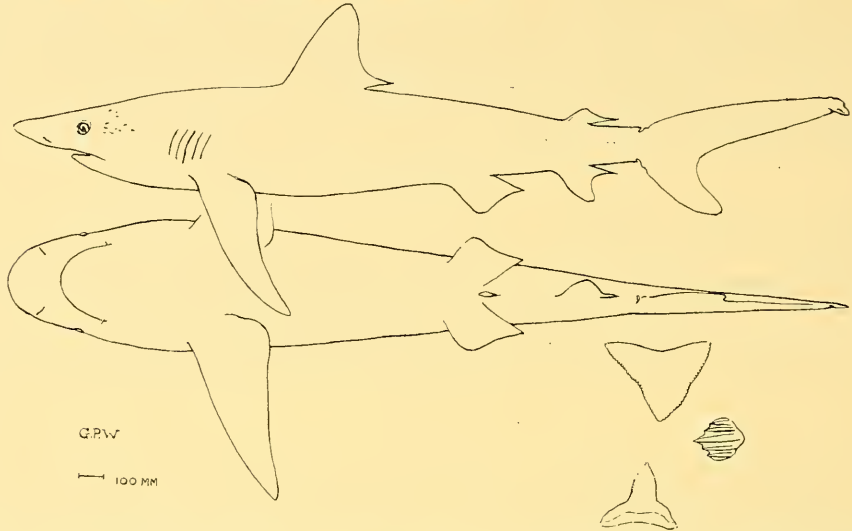


Fig. 4.—*Galeolamna (Ogilamia) stevensii* (Ogilby). A specimen from off Sandy Cape, Queensland, with teeth and denticle.

Profile of back not gibbous. Preanal length more than postanal. Denticles with five carinae.

Second dorsal fin flattened before and behind, smaller than the well-developed anal fin.

Inner pectoral angle in advance of level of first dorsal origin.

Colour dark grey above, dull greyish below. No dark tips to fins.

A more detailed specific description follows:

Eye nearer end of snout than first gill-opening.

Nostrils nearer mouth than tip of snout.

Biometrics (mm.).

H. 1	..	635	H. 14	..	333	B. 7	..	122	F. 10	..	134
2	..	767	15	..	17.5	8	..	—	11	..	120
3	..	267	16	..	18.5	9	..	—	12	..	159
4	..	338			(notch)				13	..	(vide deser.)
5	..	745	17	..	112	F. 1	..	416	14	..	673
6	..	1717	18	..	91	2	..	322	15	..	177
7	..	34				3	..	120	16	..	1000
8	..	32	B. 1	..	2425	4	..	793	17	..	180
9	..	336	2	..	1850	5	..	111	18	..	101
10	..	none	3	..	1071	6	..	95	19	..	202
11	..	36	4	..	c405	7	..	115	20	..	486
12	..	195	5	..	c447	8	..	190	21	..	777
13	..	199	6	..	123	9	..	212	22	..	382

General proportions and relative positions of fins as figured—measurements as tabled in biometrics, *supra*.

Origin of anal fin behind that of dorsal, end also behind that of dorsal.

Interorbital fairly flat, not convex as in *Galeolamna greyi*.

Teeth of upper jaw compressed, slightly notched on each side, coarsely serrated to tip, serrations largest near notches. Symphyseal teeth small, blunt and coarsely

serrated. Teeth of lower jaw not much compressed, with thick cusps and shoulders sloping from the marked notches, rather flexuous and cusps serrated to tip, but notches and shoulders entire. Symphyseal teeth blunt, in one or two rows and not serrated.

$$\text{Dental formula: } \frac{14.2.14}{14.2.14} = \frac{30}{30}.$$

Greatest width of shark is at first gill-slits.

Form rather robust, preanal length greater than postanal length. Dermal denticles close-set, imbricate, with five carinae, the central one longest, all extending across scale. Interdorsal ridge present. Back not gibbous anteriorly. Lateral line evident as a series of spaced pores posteriorly. Caudal pits present.

First dorsal elevated, nearer pectorals than ventrals, also nearer tip of snout than base of caudal. Second dorsal flattened anteriorly and posteriorly, smaller than the well-developed anal fin which has a concave outer margin. Origin and termination of anal fin behind levels of those of second dorsal.

Caudal fin with bumps behind pits and tip of upper lobe rather notched and folded. Pectoral extending to a little beyond end of dorsal fin, longer than distance between eye and last gill-opening. Inner angle of pectoral in advance of level of first dorsal origin.

Colour dark grey above, dull greyish-white below. An obscure dusky longitudinal bar on each side above ventral fins. The grey is darkest as an obscure line along an incipient caudal keel.

First dorsal light grey. Dorsal axils white. Pectoral dark grey above, white below; olive-grey tip below and narrow margin posteriorly of the same colour. Ventrals grey anteriorly on upper surface; white posteriorly and below. Lower caudal lobe lighter grey than upper. No dark tips to fins.

Ova with diameters of 10, 7, 15 and 4 mm. ovulating. Shell gland small. Uteri developed, but no embryos. Stomach empty, perhaps everted and contents ejected before death? The liver weighed 40 lb.

Described and figured from a large female specimen, 3,260 mm. or 10 ft. 10 in. long; weight 442 lb. Australian Museum Regd. No. IB.1226. Teeth and denticles.

Locality.—Keith Reef, S.W. of Sandy Cape, Fraser Island, Queensland; hooked 10.15 p.m. on fish bait and killed with 6 shots, 13th March, 1943. It appeared to be bronze coloured in the torchlight, but was grey in colour next day. It did not leap from the water as some Whalers do when hooked.

This shark agrees well with Ogilby's description of '*Carcharias stevensi*', slight discrepancies being doubtless due to different methods of measurement. The teeth in the lower jaw are partly serrated, not entire, as described by Ogilby for his much smaller type-specimen. This is the first time the species has been rediscovered and figured from an authentic specimen.

GALEOLAMNA (BOGIMBA) BOGIMBA, n. subgen., n. sp. Fig. 5.

Description of a male which differs remarkably from the female *stevensi* just described, and which evidently represents another species which may receive the new name *bogimba*.

In general, it agrees with the female *stevensi* described above, but differs notably in being more robust, with coarser shagreen, in having the lower teeth serrated, fewer teeth across jaws (25 instead of 30), no interdorsal ridge,* different relative positions of second dorsal and anal (the latter being inserted farther back), and in minor details.

Snout bluntly rounded. Interorbital slightly convex.

Teeth of upper jaw compressed, slightly excavate on outer margins, gently sloping rather than deflected, moderately and evenly serrated from base to cusp. Teeth of

* The presence or absence of an interdorsal ridge is an important character in Galeid sharks, and its absence in this specimen is one of the main reasons for my separating it from *stevensi*, of which I thought it might be the male. The interdorsal ridge is constantly present. I have found, in both males and females of *G. spenceri* and *G. macrurus*. Authors have overlooked this ridge or not mentioned it in their descriptions and its importance seems only to have been recently realized.

lower jaw thick from front to back at base, flexuous, elongate, lanceolate and strongly serrated to tip.

Dental formula: $\frac{13.0.12}{12.1.12} = \frac{25}{25}$. There is one symphyseal tooth behind the functional

series in upper jaw.

Third gill-slit longest. Very slight gibbosity in anterior dorsal profile. Whole form of shark robust.

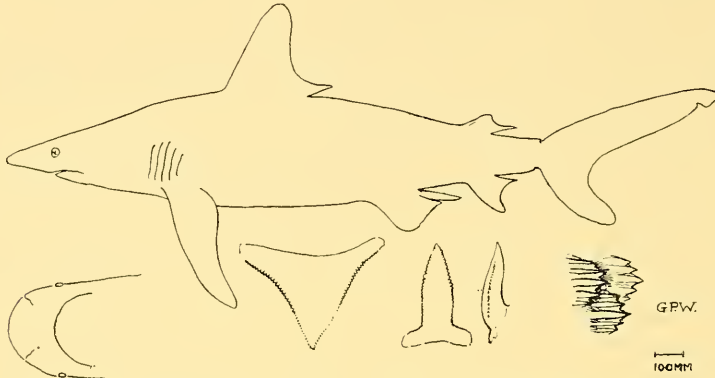


Fig. 5.—*Galeolamna (Bogimba) bogimba* Whitley. Holotype from Fraser Island, Queensland. Ventral surface of head, upper tooth, front and side views of a lower tooth, and dermal denticles.

Biometrics (mm.).

Total length ..	2544	H. 13	158	B. 5	e435	F. 9	161
H. 1	522	14	272	6	98	10	109
2	608	15	15	7	99	11	74
3	197	16	12	8	173	12	126
4	306		(notch)	9	257	13	(vide deser.)
5	570	17	120			14	507
6	1360	18	74	F. 1	382	15	211
7	22	Eye to first		2	311	16	790
8	26	gill-opening	330	3	92	17	174
9	305			4	561	18	144
10	—	B. 1	1896	5	126	19	104
	(no spiracle)	2	1475	6	112	20	350
11	39	3	818	7	88	21	654
12	164	4	400	8	172	22	330

In general proportions this specimen agrees fairly well with Ogilby's description of the much smaller type of *stevensi*, also with the large female previously described here, though its form is more robust than the latter's. The eye of my male shark goes 7.1 in preoral length as against 3.5 to 4 in Ogilby's type and 5.8 in the large female. Shagreen coarser than in female *G. (O.) stevensi*. Dermal denticles large, close-set, imbricate, with five strong separate carinae, the median largest. Pit organs conspicuous. No interdorsal ridge.

Origin and end of anal fin behind levels of those of second dorsal, the latter somewhat flattened. Inner pectoral angle before level of first dorsal origin.

Colour grey with slight bronze sheen along dorsal surface, otherwise as in *G. (O.) stevensi* female described *supra*. First dorsal with light inframarginal brownish mark. Claspers white. A broad grey edge to pectorals below.

Liver weight, 43 lb. Gonad weight, 2 lb. Testes extending full length of coelome, no milt evident. Other viscera, 20 lb.

Described and figured from a male shark, 2,544 mm. or nearly 8½ ft. long. Weight, 295 lb. Australian Museum Regd. No. IB. 1225.

Locality.—Bogimbah, Fraser Island, Queensland; hooked overnight on a bait of tuna (*Kishinoella*), 16th March, 1943. It was accompanied by three Sucker Fishes (*Echeneis neucrates*) and several golden Carangid fishes with dark bars.

Genus PROTOZYGAENA Whitley, 1940.

Protozygaena Whitley, *Fish. Aust.*, i, 1940, pp. 48, 107, 110, 111 and 274.

Orthotype, *Physodon taylori* Ogilby, 1915.

PROTOZYGAENA LONGMANI (Ogilby, 1912).

Scoliodon longmani Ogilby, *Mem. Qd. Mus.*, i, 1912, p. 30. Moreton Bay, Queensland.

Physodon taylori Ogilby, *Ibid.*, iii, 1915, p. 117. Townsville, Queensland.

On comparing the types of Ogilby's species *taylori* and *longmani* in the Queensland Museum, I was surprised to find that they were conspecific, the latter name having priority. This shark is called Fish Shark in Moreton Bay and White Eye in the Rockhampton district. I have examined numerous specimens in the Queensland and Australian Museums and live ones in the field, none more than 825 mm. long. Breeding females were noted as follows:

A. Clontarf, Woody Point, Moreton Bay, Queensland (C. R. J. Dahl), 15th March, 1932. Head of mother measured 136 mm. Six embryos, 132–210 mm. (Qd. Mus.).

B. Lindeman Island, Queensland, 13th August, 1935. Female 33 in. long with 8½ in. embryos.

C. North of Peel I., Moreton Bay, Queensland, 4th March, 1943. Length 724 mm. Five embryos in each uterus, each about 1 oz., probably near birth: six males, 212–220 mm. and four females 206–217 mm.

D. Connor's Creek, Fitzroy River, Queensland; 21st March, 1943. Females 607 and 595 mm. Ovarian eggs small. Two eggs, 28 by 12 mm., with membranes and germinal discs, in each uterus.

This shark ranges from the Northern Territory to southern Queensland. I propose to publish elsewhere detailed measurements. Stomachs contained small crabs' legs or remains of catfish, but were frequently empty.

Dental formula:
$$\frac{10 \text{ or } 11. \quad 1. \quad 11 \text{ or } 12}{10 \text{ or } 11. \quad 0 \text{ or } 1. \quad 10 \text{ or } 11}$$

No interdorsal ridge.

The relative positions of second dorsal and anal fins variable.

Typical life-colours are as follows, described from a male, 492 mm. long, from Connor's Creek:

Bronze above, with greyish sheen, and white below. Line of demarcation between dark colour above and light below passes above the eye, hence vernacular name "white eye". First dorsal bronze proximally and grey distally. First dorsal axil white. Upper edges of caudal grey; tip of lower caudal lobe white. Pectoral grey, with white posterior margin. Ventrals and anal mostly white with slight grey tinge. Eye bronze and golden; snout translucent.

Genus NEGOGALEUS Whitley, 1931.

NEGOGALEUS MICROSTOMA (Bleeker, 1852).

Hemigaleus microstoma Bleeker, *Verh. batavia Genoot.*, xxiv, 1852, Plagiost., p. 46, pl. ii, fig. 9. Batavia.

Negogaleus microstoma Whitley, *Aust. Zool.*, ix, 1939, p. 232, fig. 5.

This species, known hitherto from the East Indies and near Townsville, Queensland, may now be recorded from much farther south. In a hauling net, fishermen caught an immature female 795 mm. long and weighing 4 lb. off Myora, Stradbroke Island, Moreton Bay, Queensland, on 3rd March, 1943.

Life colours: Grey above, white below, the junction strongly marked. Three or four dark grey spots between the dorsal and pectoral fins on both sides of the body. A bronze sheen along middle of sides. Some pinkish on snout. Eyes olive and grey, outer edge pale bronze; nictitating membrane same colour as side of head. Fins all narrowly edged whitish except anterior margin of first dorsal and whole of second dorsal.

Liver weight $2\frac{1}{2}$ oz. Stomach contained remains of squid. A dip in lateral line between second dorsal and anal fin. An interdorsal ridge from end of dorsal lobe to above end of ventral fin. Pectoral tips pointed.

Teeth and denticles preserved. Australian Museum Regd. No. IB.1331.

Genus NOTOGALEUS Whitley, 1931.

NOTOGALEUS RHINOPHANES (Péron, 1807).

Squalus rhinophanes Péron, *Voyage aux terres australes*, i, 1807, p. 337; ed. 2, ii, 1824, p. 218. Adventure Bay, Tasmania.

Squalus rhiophannes (sic) Péron and Freycinet, *Entdeckungsreise nach Australien* (trans. T. F. Ehrmann), i, 1808, p. 406.

Galeus australis Macleay, Proc. LINN. Soc. N.S.W., vi, 1881, p. 354, Port Jackson.

Péron's brief description of *Squalus rhinophanes* from southern Tasmania refers to the School Shark which I have found commonly in d'Entrecasteaux Channel. *Galeus australis* Macleay from Sydney is conspecific and a synonym.

Family RHINOBATIDAE.

RHINOBATOS BATILLUM Whitley, 1939. Fig. 6.

Four large examples were netted at Myora, Stradbroke Island, Queensland, on 3rd March, 1943, this being the southernmost record for the species. One was male, the other three females, and their stomachs contained prawns, Alpheidae, and crab-remains. A remarkable fact was that two had abnormal snouts as if the normal 'shovel-nose' had been blunted through bumping against objects. A figure of the abnormality is given here; normal specimens are illustrated in my "Fishes of Australia", i, 1940, p. 168, figs. 189 and 190.

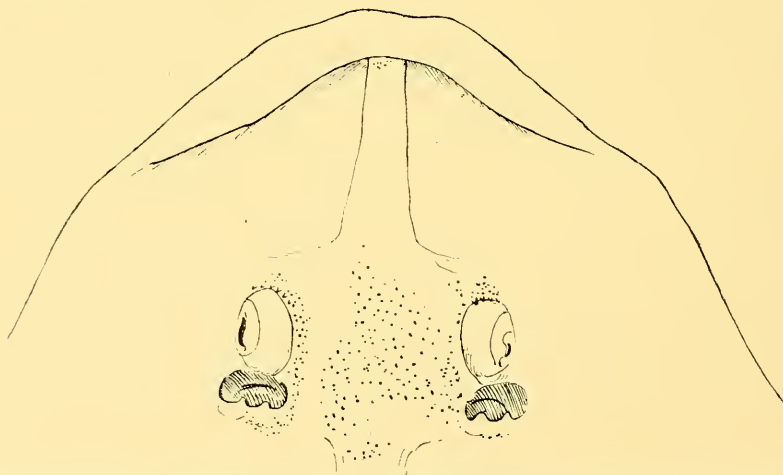


Fig. 6.—*Rhinobatos batillum* Whitley. Dorsal view of a specimen from Stradbroke Island, Queensland, showing abnormal snout.

It is possible that Castelnau's species *dumerilii*,* which has not been recognized since first described, may have been founded upon a similar aberration in Western Australia; if so, his earlier name will replace mine for the species.

Family RAJIDAE.

Genus ZEARAJA Whitley, 1939.

ZEARAJA NASUTA (Müller & Henle, 1841).

Raja nasuta Müller and Henle, *Syst. Plagiost.*, 1841, p. 150. *Ex* Banks, MS. "Sudsee" = Totaeranue, New Zealand (*vide* Richardson in 'Dieffenbach, Trav. N.Z.', 1843, p. 227).

A female, 960 mm. long by 686 wide, was trawled off southern New South Wales by the "Bar-ea-Mul" at the end of October, 1942. Australian Museum Regd. No. IB.1179.

* Castelnau, *Proc. Zool. Acclim. Soc. Vict.*, ii, 1873, p. 148.

Rhinobatos batillum Whitley.

No.	Sex.	Total Length in mm.	Predorsal Length.	Width of Disc.	Snout from Ant. Margin of Eye.	Interorbital, Min. and Max.	Inter- splanchnic.	Preeoral Length.	Width of Mouth.	Liver Weight.	Condition.	Stomach-Contents.	Remarks.
1	♂ + ♀	1340	1000	460	256	64 (85)	67	270	85	11 oz.	No ova or embryos apparent.	Carid prawns.	—
2	♂ + ♀	1080	1005	570	300	68 (102)	85	318	105	1½ lb.	No ova or embryos.	Indeterminable.	—
3	♂ + ♀	1183	765	520	125	67 (95)	75	141	91	13 oz.	Testes immature; claspers, 88 mm.	Prawns.	Snout deformed.
4	♂ + ♀	1120	628	390	110	60 (78)	60	120	77	7 oz.	No ova or embryos.	Alpheidae, prawns and crabs.	Snout deformed.

Preocular, 220; interorbital, 55; eye, 29; internarial, 94; preoral, 250; width of mouth, 90; claspers, 150.

Colour greenish-grey above with diffuse dark scapular blotches. Tenacula present. Dental formula 41/43. A few spines and some granules around eye. Stomach contained red oil. Peritoneum white. Testes white, granular, 90 mm. long.

New record for New South Wales.

Genus *SPINIRAJA* Whitley, 1939.

SPINIRAJA WHITLEYI (Iredale, 1938). Figs. 7, 8.

Raja whitleyi Iredale, *Aust. Zool.*, ix, 1938, p. 169. Port Phillip, Victoria. New name for *Raja scabra* Ogilby, preoccupied by Linnaeus. See Whitley, *Aust. Zool.*, ix, 1939, p. 249 for references and synonymy.

Raja (Spiniraja) ogilbyi Whitley, *Ibid.*, ix, 1939, p. 251. Manly, New South Wales.

In Victoria and Tasmania, in 1942, I saw several examples of this, the Great Skate, hooked on long-lines used in the shark-fishery. From these it was evident that *ogilbyi* is a synonym of *whitleyi*, the characters relied upon for separating the two being variable. This species was collected in the D'Entrecasteaux Channel, Tasmania, and is evidently the large ray of the Adventure Bay region noted by Péron in 1802, although the species has not yet been catalogued from Tasmania. When describing the eggs of Australian skates in the *Australian Museum Magazine* (Vol. vii, No. 11, 1938, p. 381, figs. 22 to 24),

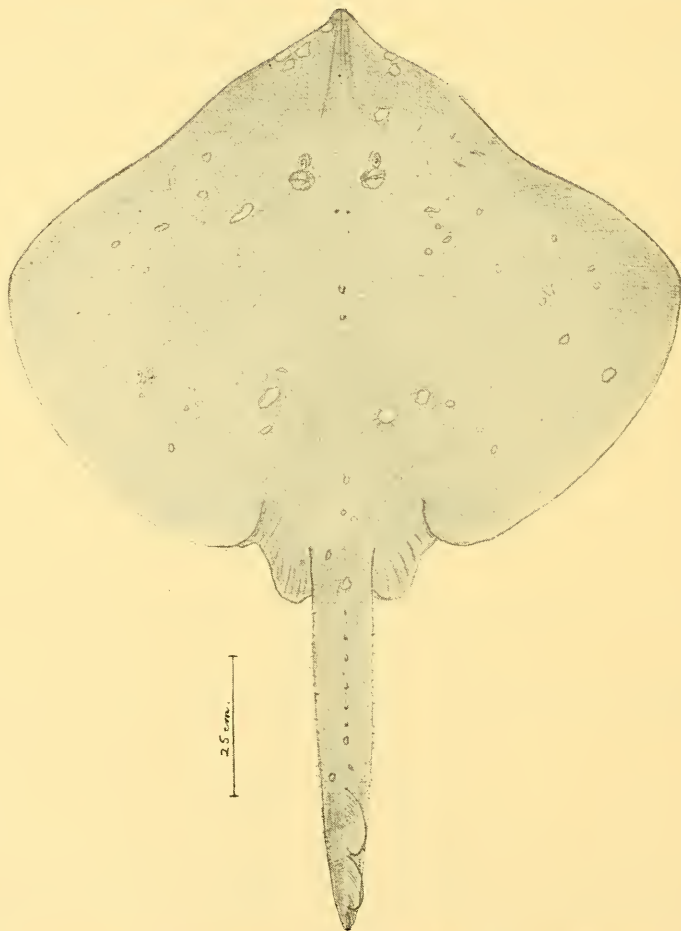


Fig. 7.—*Spiniraja whitleyi* (Iredale). Dorsal view of a specimen from Kettering, Tasmania.

I remarked of the "Stringybark" type of egg: "If we can associate this great egg with the largest Australian skate, then it may be that of *Raja scabra* [now *Spiniraja whitleyi*], which grows to 5½ ft. in length and is trawled off New South Wales and Victoria, though it has not yet been recorded from Tasmania." My association was correct, for, when sharking in 8 fathoms off Kettering, D'Entrecasteaux Channel, Tasmania, on 5th July, 1942, my companions and I caught a large female Great Skate inside which were two partially-formed egg-cases of the "Stringybark" type.

Following is a description of the largest southern Tasmanian specimen seen by me (dimensions in millimetres):

Anterior outline of disc bisinuate. Form as described for *ogilbyi* (loc. cit., 1939). Long rostral cartilages present. Interorbital sunken. Spiracles large, without raised folds. Internasal valve with a rounded flap over each nasoral groove. Fifteen fringes across frenum. Dental formula 48/45. Crowns of teeth blunt. Two vestigial buccal processes. Tongue emarginate. Usual velum maxillare.

No ocular spines. One or two nuchal spines. Disc spinose, with spaced embedded spines. Ten spaced spines along top of tail. One or two rows of thorn-like spines each side of tail. No spines between dorsals. No pigmented pores on ventral surface.

Total length, 1,680 mm. Snout to level of root of tail, 965. Snout to anterior margin of vent, 857. Vent, 78. Vent to tip of tail, 745. Snout to pectoral angle, 875; to pectoral margin, 860; to level of widest part of disc, 504; to level of eyes, 260. Preocular length, 272. Width at level of eyes, 554. Eye, 45. Snout to nostril, 220; to aqueductus vestibuli, 363. Interorbital, 117. Interspiracular, min. 123, max. 187. Eye to spiracle, 36. Internasal, 181. Width of mouth, 158. Preoral length, to lip-fold 239; to teeth, 293. Snout to level of first gill-opening, 422. First gill-openings, 288; third, 317; fifth, 197. Fifth gill-slit to pectoral edge, 484; to vent, 315. Base of tail, across, 116. Snout to insertion of ventral fin, 830. Disc: width, 1,170; length, 968. Origin of first dorsal fin to end of same, 110; to end of tail, 266. Base of second dorsal, 101. Tail, 685. A fold on each side of tail, beside the one (50 mm. long) behind the second dorsal fin.

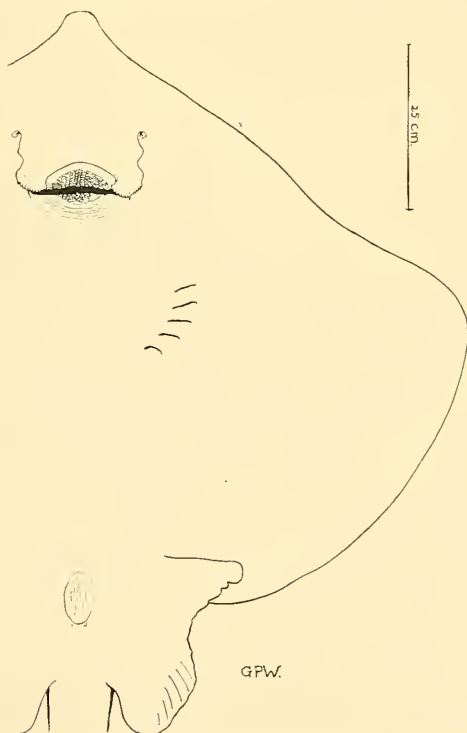


Fig. 8.—*Spiniraja whitleyi* (Iredale). Ventral view of same specimen as in Fig. 7.

General colour, slate grey above with cream or white flecks and spots of various sizes, sparsely and asymmetrically distributed. Ventral surface white. Lower surface of tail mottled greyish. Eye dark grey with a lighter grey dendritic flap over it.

Described and figured from a female specimen about 5½ ft. long.

The liver weighed about 2 lb. Stomach contained some liquid and a cephalopod beak.

Many large ovarian eggs. An egg in the highly vascular left uterus. An embryo and partly formed egg-case in right uterus, the embryo lying towards anterior end of skate, followed by the mass of yolk, then the unpigmented (white) egg-shell, becoming hard and greenish towards the cloaca. The egg is of the "Stringybark" or "Tinder Box" type of my 1938 essay.

Locality.—Off Kettering, D'Entrecasteaux Channel, Tasmania; long-line in about 8 fathoms, 5th July, 1942. Caught by M. Blackburn, R. Farnell and self.

Variation.—Males have more pointed teeth, four rows of tenacula, and claspers of variable length in comparison with their grand bulk. The nasoral lobe may be pointed or blunt.

The following table exhibits some biometric measurements of several examples. Specimens were often so large and unwieldy that they could hardly be handled on a small boat, so that even the sex of some specimens was not determined. Fishermen usually cut them loose as they tangle the lines and are very heavy to haul in. Isopods and copepods are usually found on the belly and leeches above the disc.

FAMILY CLUPANODONTIDAE.

GENUS FLUVIALOSA Whitley, 1943.

FLUVIALOSA ELONGATA (Macleay, 1883). Fig. 9.

Chatoessus elongatus Macleay, Proc. Linn. Soc. N.S.W., viii, 1883, p. 209. Mary River, Queensland; freshwater lagoons.

Fluvalosa elongata Whitley, Aust. Zool., x, 1943, p. 170.

This species has not hitherto been figured, so this opportunity is taken to publish a drawing of Macleay's holotype, which is preserved in the Australian Museum (Regd. No. IA.6018); it is 11 in. in total length.

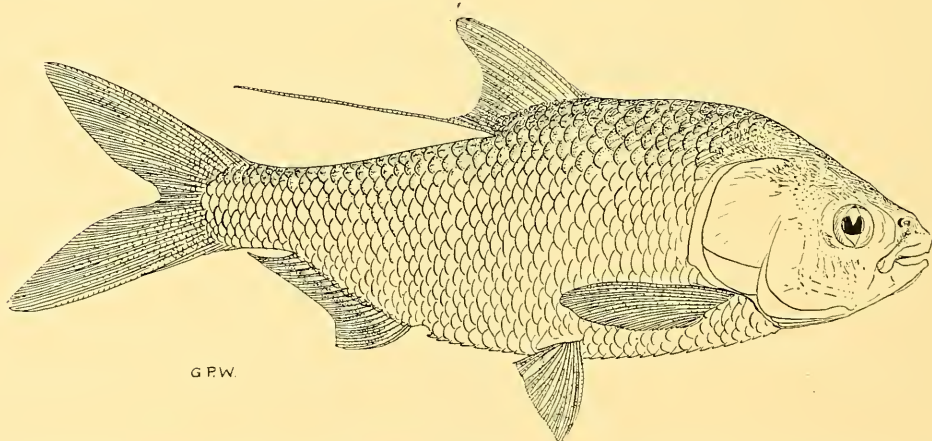


Fig. 9.—*Fluvalosa elongata* (Macleay). Holotype from Maryborough, Queensland.

FAMILY ESOCIDAE.

ESOX AUSTRALIS Cuv. & Val., 1846.

A species of pike was named *Esox australis* by Cuvier and Valenciennes (*Hist. Nat. Poiss.*, xviii, 1846, p. 323; ed. 2, p. 240) from "la terre de Diemen", i.e., "Tasmania"; collected by Francois Péron.

Specimen.	Sex.	Locality.	Date.	Total Length (mm.).	Width of Disc.	Length to Vent.	Precoral Length.	Width of Mouth.	Dental Formula.	Inter-orbital.	Inter-spiracular.	Inter-narial.	Remarks.
A.	♀ Imm.	15 miles off King Is., Bass Strait.	2.iii.42	1780	1370	c. 1060	310	—	53/46	190	140	210	Base of first dorsal, 110; of second, 100.
B.	♂	Lime Bay, S. Tasm.; 2 faths.	27.iii.42	1145	830	650	210	133	40/39	—	90	130	Few rugosities around eye. Snout to end of pectorals, 660.
C.	♂	do.	27.iii.42	1270	—	680	230	117	—	115	—	130	
D. (Tag. 6)	♂	Off Perch Bay, Kettering, Tasm.	22.vi.42	1498	1000	816	252	153	—	142	110	165	Precorbital, 265. Clasper, 395.
E. (Tag. 7)	♂	do.	22.vi.42	1432	—	755	235	132	—	—	—	144	
F. (Tag. 52)	♂	Shepherd's, N.W. Bay, S. Tasm.	27.vi.42	—	860	—	—	—	—	—	—	—	
G.	♀	Off Oyster Cove, S. Tasm.	27.vi.42	—	1120	—	—	—	—	—	—	—	Ovarian eggs; nothing in uterus.
H.	♀	Off Kettering, S. Tasm.	5.vii.42	1680	1170	870	293	158	48/45	117	123	181	(Described in detail above.)
I. (Tag. 113)	♂	Shepherd's, N.W. Bay, S. Tasm.	6.vii.42	—	914	—	—	—	—	—	—	—	Another hook in max.
J. (Tag. 128)	♂ Imm.	Bull Bay, S. Tasm.	22.vii.42	985	710	—	178	97	—	—	—	—	Clasper, 91. Vomited octopus.
K. (Tag. 129)	♂	do.	22.vii.42	c. 1340	916	—	—	—	—	—	—	—	
L. (Tag. 132)	♂ mature.	do.	22.vii.42	1320	970	—	c. 222	c. 140	—	—	—	—	
M. (Tag. 137)	♂	Sandy Bay, Hobart, Tasm.	25.vii.42	1177	802	625	187	—	—	80	—	121	Tail, 580. Snout to first dorsal, 1000. Precorbital, 187. Claspers, 312.

I saw the type-specimen in the Museum National d'Histoire Naturelle, Paris, in 1937, and it is a species of true pike from the Northern Hemisphere; obviously the Australian locality was an error of labelling and the species should be expunged from our lists.

Family ATHERINIDAE.

The fishes of this family, generally known as Silversides or Hardyheads, are small in size, but congregate in great schools. It is likely that commercial use may be made of them in the future, either as canned fish or as live-bait for larger food-fishes. Nominal species have been described from all the States of the Commonwealth, but as most of the old type-specimens (when such exist) are scattered through museums in Europe, it is difficult for local investigators to identify the numerous species correctly. I have seen types and other specimens in European and Australian museums and have collected specimens in several States. The following notes are based on work done over the past decade and may be regarded as a preliminary sifting prior to a long-overdue revision of the family.

Tentative Key to Genera of Australian Atherininae (Modified after Jordan and Hubbs, 1919).

- A. Head scaled on sides and top, trunk wholly scaled; body not sharply compressed; belly without a fleshy keel; head not abruptly truncated posteriorly; gill-slits wide; anal fin with less than 18 rays.
- B. Rows of sharp tooth-like spines on head. Anus scarcely advanced in position . . . *Atherion*
- BB. No spines on head. Anus advanced, usually between the adpressed ventral fins.
- C. Gill-rakers slender and numerous (15 or more on lower limb of first gill-arch); maxillary reaching to below or beyond front of eye. Teeth fine in jaws, sometimes present on vomer.
- D. Rami of mandibles usually not much elevated. Premaxillary processes short and blunt. Build coarse and robust. Scales 32 to 45, usually less than 40 *Pranesus*
- DD. Rami of mandibles sharply curved upwards posteriorly. Premaxillary processes slender, sometimes one-half to as long as eye.
- E. Scales less than sixty (usually from 33 to 43 between head and hypural joint).
- F. Scales 33 or 34 *Allanetta*, n. gen.
- FF. Scales more numerous, usually about 37 to 44 *Atherinosoma* (with subgenera *Taeniomembras* and *Pranesella*)
- EE. Scales more than sixty (usually 73 to 75) *Atherinason*
- CC. Gill-rakers short, 12 or less on lower limb of first gill-arch. Mouth smaller, maxillary not reaching beyond front of eye. Teeth microscopic in jaws, none on vomer. Rami of mandibles elevated. Scales 25 to 35. Anus between ventral fins. Generally freshwater, but some species in estuaries *Craterocephalus*
- AA. Head and adjacent part of trunk naked; body sharply compressed; belly with a fleshy keel; head abruptly truncated posteriorly; the gill-slits behind the first much restricted. Anal fin with 23-27 rays. Lives in surf *Iso*

ATHERINOSOMA ESOX (Klunzinger, 1872). Fig. 10, No. 3.

Atherinichthys esox Klunzinger, *Arch. Naturgesch.*, xxxviii, I, 1872, p. 34. Port Phillip, Victoria.

Atherinichthys modesta Castelnau, *Proc. Zool. Acclim. Soc. Vict.*, i, 1872, p. 136. Hobson's Bay (type-locality selected by Jordan and Hubbs, 1919) and Lower Yarra, Victoria.

Atherinichthys cephalotes Castelnau, *Ibid.*, p. 137, Hobson's Bay, Victoria. Type in Paris Museum; photo of type in Australian Museum.

Atherinichthys picta Castelnau, *Ibid.*, p. 137. Lower Yarra, Victoria. Types lost.

Two specimens of *Atherinichthys esox* Klunzinger, examined by me in October, 1937, in the Württembergische Naturaliensammlung at Stuttgart, had the vent half-way between origin of anal and of ventrals, and 12 anal rays. They agree with my notes and figures, made a few days earlier in Paris, on the type of *A. modesta* Castelnau. Thus *modesta*, the type of which is figured here, is a synonym of *esox*.

ATHERINOSOMA ROCKINGHAMENSIS, n. sp.

A series of Hardyheads from a land-locked lagoon at Rockingham, Western Australia, is superficially like *elongata* (Klunzinger) but has a reduced number of scales and fin-rays.

Ten soft rays in dorsal and anal fins. Scales 37 to 38. Predorsal 14. Tr. 6 or 7. Teeth well developed on jaws and vomer. Mandibles without ascending rami. Depth of body $6\frac{1}{2}$ to 7 in standard length.

Vent between ventral fin-tips. Origin of dorsal little behind level of ventral origin, nearer snout than tail. Anal origin before level of second dorsal origin. Base of anal less than its distance from caudal. Pectoral plain.

Holotype (Australian Museum Regd. No. 1A.7710) and paratypes in the Australian Museum. Received from Mr. A. J. Fraser, Chief Inspector of Fisheries, Perth, W.A.

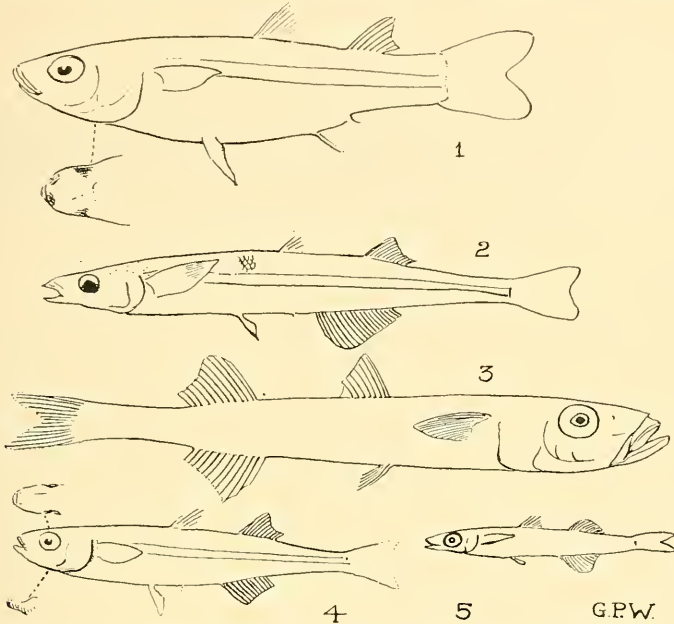


Fig. 10.—No. 1. *Craterocephalus pauciradiatus* (Gunther). Holotype from North-West Australia. Also top of head of same. No. 2. "*Atherina jacksoniana* Quoy & Gaimard". Lectotype from "Port Jackson", error for some South American locality. No. 3. *Atherinosoma esox* (Klunzinger). Holotype of *Atherinichthys modesta* Castelnau from Victoria. No. 4. *Atherinosoma microstoma* (Gunther). Lectotype from Tasmania. Also top of head and mandible. No. 5. *Craterocephalus edelensis* (Castelnau). Holotype of *Atherinichthys obscurus* Castelnau from Swan River, Western Australia.

ATHERINOSOMA MICROSTOMA (Gunther, 1861). Fig. 10, No. 4, and Fig. 11.

Atherina microstoma Gunther, *Cat. Fish. Brit. Mus.*, iii, 1861, p. 401. Tasmania. Types in British Museum (Nat. Hist.).

Br. 6. D. vi/9; A.i, 8; P. 13; V.i, 5; C. 15. Sc. 37. Tr. 8. Predorsal sc. 14. Preanal and interdorsal scales 6.

Head (13 mm.) 3.8, depth (10) 5 in standard length (50). Eye 4.5 mm., inter-orbital 4, snout 3, caudal peduncle 4, pectoral fin 8 mm.

Form elongate, compressed; anterior portions of back and belly not keeled but flattened. Head scaly, except before the large eyes. One row of cheek-scales. Inter-orbital flat. Preopercular ridges without spines; operculum rounded, not truncate, posteriorly. A series of pores on preorbital and above and behind eyes. Mouth fairly large with well-developed hooked teeth on jaws. Vomer also toothed. Maxillary not quite reaching eye when mouth is closed. Mandibular rami not elevated. Premaxillary processes short. Gill-rakers slender, with a few minute spines; there are about twelve along the lower portion of the first branchial arch. Gill-slits wide; isthmus very narrow.

Body covered with large cycloid scales which are not crenulated. Less than forty transverse and about eight longitudinal scale-rows; fourteen predorsal and six interdorsal and preanal scales.

Dorsal fins well separated, the first with six weak spines whose greatest height is almost equal to interdorsal space; no produced spines. First dorsal nearer muzzle than root of caudal. Anal base longer than that of dorsal, but shorter than its distance from

the caudal. Anal origin in advance of second dorsal origin. Pectorals pointed, highly inserted, the fourth ray longest. Ventrals in advance of level of origin of first dorsal fin, their tips reaching the vent, which is well in advance of the anal fin. Caudal forked, upper lobe the longer.

Colour, in life, pale olive-greenish above with the margins of the scales darker. The silvery lateral stripe has a good deal of red in it, at times changing to bright coppery. Belly silvery. Eye white, with some red above; pupil black. Fins yellowish with dark

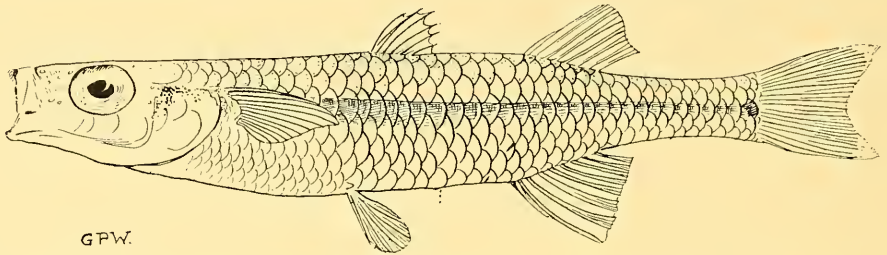


Fig. 11.—*Atherinosoma microstoma* (Gunther). A specimen from Dee Why, New South Wales.

chromatophores at their bases. A dark line along base of anal fin and below the caudal peduncle. A row of small dark spots below the lateral stripe anteriorly. No dusky blotch on pectoral fin. Snout, tips of jaws, edges of dorsal scales, bases of pectorals, and a median blotch on caudal peduncle blackish in the dead fish.

Described and figured from a specimen 50 mm. in standard length or 2¼ in. overall, the largest of a series.

Locality.—Dee Why Lagoon, near Sydney, New South Wales; shallow brackish water, in schools, 12th September, 1938.

Genus PRANESUS Whitley, 1930.

Pranesus Whitley, *Mem. Qd. Mus.*, x, 1930, p. 9.

Orthotype, *P. ogilbyi* Whitley from Queensland.

PRANESUS ENDRACHTENSIS (Quoy & Gaimard, 1825).

Atherina endrachtensis Quoy and Gaimard, *Voy. Uranie et Physicienne, Zool.*, 1825, p. 334. "Baie des Chiens Marins, à la terre d'Endracht", i.e., Shark's Bay, Western Australia. Type in Museum National d'Histoire Naturelle, Paris, seen by me in 1937.

Atherina cendrachtensis Weber and de Beaufort, *Fish. Indo-Aust. Archip.*, iv, 1922, p. 270 (refs.).

I was fortunate in securing an example of this fish from its type-locality, enabling me to add some details to Quoy and Gaimard's original account. It differs slightly from the type in fin-formulae and has adherent scales but is obviously conspecific.

D. vi/i, 10; A.i, 10. Sc. 43 (or 39 along lateral band). Tr. 7. 18 predorsal and 7 interdorsal scales. Twenty or so gill-rakers on lower limb of first gill-arch. Head (32 mm.) 3.7, depth (25) 4.8 in standard length (120). Eye, 12 mm.; interorbital, 11; snout, 7; least depth of caudal peduncle, 8.5; pectorals, 25; width of body, 18 mm. Premaxillaries slender throughout their length, not dilated posteriorly, their margins slightly excavated antero-laterally. Premaxillary processes short. No upturned mandibular ramus. Fine villiform teeth in bands on jaws, tongue and vomer. Some large pores on top of head and several before the large eyes. Body robust, covered with adherent cycloid scales, some crenulated.

First dorsal fin originating over the ventral-anal interspace, behind level of anus, but over adpressed tips of ventrals, and nearer root of tail than snout. Anal origin in advance of level of second dorsal origin. Pectorals high, pointed. Anus between ventral fins; vertical through anus and vertical through first dorsal origin separated by four scales. Caudal forked.

Straw coloured, densely punctulated on back. Edges of dorsal scales darker brownish with close-set blue spots. Snout and vertex dusky. Some blue spots on top of head. Opercles silvery. A broad silvery lateral band overlying a row of dusky spots corresponding to the scales. Similar blotches along some of the next row of scales below and other spots along abdomen over anal fin. Pectorals with dusky tips, other fins whitish with fine punctulations.

Locality.—Denham, Shark's Bay, Western Australia; 13.vii.1939 (G. P. Whitley). Australian Museum Regd. No. IB.281. Total length nearly 6 in.

Genus CRATEROCEPHALUS McCulloch, 1912.

CRATEROCEPHALUS EDELENSIS (Castelnau, 1873). Fig. 10, No. 5.

Atherinichthys edelensis Castelnau, *Proc. Zool. Acclim. Soc. Vict.*, ii, 1873, p. 134. Fremantle, W. Australia. Types (No. 4303) in Paris Museum seen.

? *Atherinichthys obscurus* Castelnau, *Vict. Offic. Rec. Philad. Exhib.* 1875, *Res. Fish. Aust.*, p. 31. Swan River, Western Australia. Types (No. 4372) in Paris Museum seen, labelled "Dampierre".

D. v/i , 8; A.i, 9; Sc. 32. Tr. 6. 14 predorsal scales. 5 interdorsal scales. 9 short blunt gill-rakers on lower limb of first branchial arch.

Head (15 mm.) 3.8, depth (11) 5.2 in standard length (58). Eye 5 mm.; interorbital, 5; snout 4; least depth of caudal peduncle, 5; pectorals 10; width of body, 9. Premaxillary processes short.

Premaxillaries excavated, their posterior portion thick. Mandibular rami elevated. Very fine teeth on jaws. Pores on head inconspicuous.

Body elongate, fairly robust anteriorly, covered with cycloid scales with entire margins.

First dorsal fin originating over the ventral-anal interspace, 3 scale-rows behind level of anus but over tips of adpressed ventrals, and nearer root of tail than snout. Anal origin well in advance of vertical of second dorsal origin. Pectorals high, acute. Anus between ventral fins, the latter nearer pectorals than anal. Caudal excavate.

Straw-yellowish, scales along back with large dark chromatophores ascending over bases of upper caudal rays. Median scales of back with blue spots. Snout and vertex rather dusky, a median patch of blue spots over head before eyes. Opercles silvery. A broad silvery lateral band, darkest superiorly and expanding towards root of tail but not overlying any dark blotches. A few rows of spaced black dots on sides below the silvery band. Anal base dusky. Pectorals plain, as are most of the fins except for slight punctulation.

Locality.—Denham, Shark's Bay, Western Australia; in sea, 13.vii.1939 (G. P. Whitley). Australian Museum Regd. Nos. IB.282-289, eight specimens about 2½ in. long. I have seen the types of Castelnau's species, *Atherinichthys edelensis* and *obscurus* in the Paris Museum. They are shrivelled little specimens and their characters are very difficult to make out. The accompanying figure is of the type of *obscurus*.

However, they seem to be conspecific and the differences between my specimens and Castelnau's brief descriptions may perhaps be accounted for by the poor state of his specimens. According to him, both "species" appear to have more fin-rays and scales than I can see in my specimens.

CRATEROCEPHALUS PAUCIRADIATUS (Gunther, 1861). Fig. 10, No. 1.

Atherina pauciradiata Gunther, *Cat. Fish. Brit. Mus.*, iii, 1861, p. 401. N.W. Australia.

The accompanying figure represents the type-specimen of *Atherina pauciradiata* Gunther which I sketched in the British Museum (Regd. No. 56, 9, 19, 1513). It had Sc. 29, predorsal sc. 10; tr. 9. Mandibular rami elevated. Anus between middles of ventral fins. Gill-rakers short, at least 8 on lower half of first gill-arch in a second unlocalized specimen (No. 55, 9, 19, 1527), which had 8 anal rays. Length 2½ in.

ALLANETTA, n. gen.

Orthotype, *Atherina mugiloides* McCulloch (*Proc. Roy. Soc. Qd.*, xxiv, 1913, p. 47, fig. 1, from Cape York) = *Allanetta punctata* (De Vis).

Differs from the old world *Atherina* Linnaeus, 1758 (type, *A. hepsetus*), in having Sc. 33-34 instead of between 50 and 60, besides other characters described by McCulloch. On examining his type-specimen, I find that it also has the anus between the adpressed ventral fins, mandibular rami elevated, fairly numerous gill-rakers, and premaxillary processes about three-quarters eye. It comes near the *Atherina* section of Jordan and Hubbs' key (*Stanford Univ. Publ., Stud. Ichth.*, 1919, p. 14), but differs notably in having larger scales. *Atherina mugiloides* was a new name provided by McCulloch for *Atherinichthys punctatus* De Vis (*Proc. LINN. Soc. N.S.W.*, ix, 1885, p. 869) which he regarded as preoccupied by *Atherina punctatus* Bennett, 1832. As the two species called *punctatus* are not congeneric (see McCulloch, loc. cit., p. 49), *Atherina mugiloides* now becomes a synonym of *Allanetta punctata* (De Vis, 1885).

"ATHERINA JACKSONIANA Quoy and Gaimard." Fig. 10, No. 2.

Atherina jacksoniana Quoy and Gaimard, *Voy. Uranie et Physicienne, Zool.* "1824" (published early 1825, *vide* Sherborn), p. 333. Described from Port Jackson = Sydney Harbour, N.S.W. Type in Paris Museum. Id. Cuvier and Valenciennes, *Hist. Nat. Poiss.*, x, 1835, p. 461; ed. 2, p. 342. (Port Jackson and Van Diemen's Land. Resembles United States species.) Id., Richardson, *Rep. 12th Meet. Brit. Ass. Adv. Sci.*, 1842 (1843), p. 22. Listed from New Holland only. Id., Gray, *Cat. Mus. Roy. Coll. Surgeons*, 1859, *Vertebr.*, p. 41 (Port Jackson and Sumatra [perhaps error for Tasmania?—G.P.W.]).

Atherinichthys jacksoniana Gunther, *Cat. Fish. Brit. Mus.*, iii, July, 1861, p. 402. Id., Castelnau, *Proc. LINN. Soc. N.S.W.*, iii, 1879, p. 353. Id., Macleay, *Ibid.*, vi, 1881, p. 41; *Descr. Cat. Aust. Fish.*, ii, 1881, p. 41. Id., Johnston, *Proc. Roy. Soc. Tasm.*, 1882 (publ. 1883), p. 122 *et* *Ibid.*, 1890 (1891), p. 34. Id. Ogilby, *Cat. Fish. N.S.W.*, 1886, p. 40.

Chirostoma jacksoniana Waite, *Mem. N.S.W. Nat. Club*, 1904, p. 21.

Craterocephalus jacksonianus Jordan and Hubbs, *Stanford Univ. Publ. Stud. Ichth.*, 1919, *Atherinidae*, p. 46.

Atherina jacksoniana McCulloch, *Aust. Zool.*, ii, 2, 1921, p. 50, and *Aust. Zool. Handbook*, I (*Fish. N.S.W.*), 1922, p. 40. Id., Lord, *Proc. Roy. Soc. Tasm.*, 1922 (1923), p. 66; Lord and Scott, *Synops. Vertebr. Anim. Tasm.*, 1924, p. 49; and Lord, *J. Pan-Pacif. Res. Inst. Honolulu*, ii, 4, 1927, p. 14. Id., McCulloch, *Aust. Mus. Mem.*, v, 1929, p. 107.

This species described from "Port Jackson" by Quoy and Gaimard in 1825 has puzzled all later workers on Australian fishes because none of our Atherines has 18 anal rays or agrees in other particulars. When in Paris in 1937, I made a point of seeing Quoy and Gaimard's types. These were five Atherines, unlike any known to me from Australia, having very long bodies and very small scales. I designate the largest of the five as lectotype (No. 2895) and offer a sketch of it here. It was 106 mm. in standard length or $4\frac{3}{4}$ in. overall and had the following characters: Head, 22 mm. (jaws somewhat extended). Interorbital 5 mm. Two rows of cheek scales. Mandibular rami elevated. Teeth distinct. Gill-rakers slender and numerous. Scales 80. Five rows of scales over lateral band. Vent well behind tips of ventral fins and well before anal. Pectorals with dusky tips. A broad silvery lateral band. About 12 or 13 dorsal and 18 anal rays.

This species has never been caught around Sydney, and the only Tasmanian record seems to be Cuvier and Valenciennes' locality, Van Diemen's Land. There are several species of Tasmanian Atherines, but I know of none with 18 anal rays. *A. jacksoniana* is obviously not Australian at all, but is apparently South American, because the "Uranie", whose naturalists collected the species, was wrecked at the Falkland Islands and the collections were somewhat confused or partly lost.

Itinerary of the "Uranie".

According to M. Jacques Arago's book, *Souvenirs d'un Aveugle. Voyage autour du Monde*, published in Brussels in 1840, the route of the "Uranie" expedition was Toulon, Gibraltar, Canaries, across the equator to Rio de Janeiro, then eastward to the Cape of Good Hope, Ile de France [Mauritius], and thence Western Australia at Péron

Peninsula, up the north-west coast to westernmost New Guinea, Waigiou, the Mariannes and Hawaii, then back to eastern Australia (Port Jackson, New South Wales). From here they crossed the Pacific and rounded the Horn, until in the Iles Malouines [Falkland Islands] the "*Uranie*" struck a rock and was wrecked. Arago, who was on board, relates (p. 465), "je perdais dans cette catastrophe le fruit de plus de trois ans de fatigues, de recherches et de sacrifices . . . mes belles collections d'oiseaux, d'insectes, et . . . douze ou quinze albums. . ."

[It is safe to assume that Quoy, Gaimard, and other naturalists aboard the "*Uranie*" also lost their collections or had them mixed up or damaged, so that the Atherines may have been mixed with an Australian collection.] Some time later, an American ship, the "*Mercury*" (Capt. Horn) picked up the shipwrecked Frenchmen, who bought her, renamed her "*La Physicienne*" and returned in her to France *via* Montevideo and Rio. A plate opposite p. 472 of Arago's book shows the shipwreck.

Jacques Etienne Victor Arago must not be confused with any of his brothers or other relatives, many of whom were great French savants of the 18th-19th centuries. He was born in the Pyrenees in 1799 and died in Brazil, 1855.*

When in Ann Arbor, Michigan, U.S.A., I showed my notes and sketch to Professor Carl Hubbs, the monographer with Jordan in 1919 of all the known Atherines. He immediately recognized Quoy and Gaimard's fish as belonging to a South American group. He thought it was probably from the Straits of Magellan and near *Odontesthes laticlavia*, of which we inspected a Chilean specimen, or an allied species. The precise identification of *Atherina jacksoniana* with any South American form has not yet been effected,† and, unfortunately, the name *jacksoniana* being earlier than that of any South American species, will have priority. The purpose of this preliminary note is to remove *Atherina jacksoniana* from the Australian list, especially as other Australian Atherines are now assuming commercial importance.

M. J. Berlioz (*Bull. Mus. Hist. nat. Paris*, xxxiii, 1927, pp. 350-352) discussed a somewhat similar mixture of localities in the case of a cormorant collected by the "*Uranie*" expedition, wherein a bird reported from Shark's Bay, Western Australia, was demonstrated to have come from the Falkland Islands. Mr. T. Iredale also informs me that a marine snail, *Nassa jacksoniana* Quoy & Gaimard, was actually a foreign shell, probably from Mauritius.

The last list of Australian Atherines appeared in McCulloch's Check-List (*Aust. Mus. Mem.*, v, 1929, pp. 107-110), but *Atherinosoma* on p. 111 should be transferred into Atherinidae, wherein 22 nominal species appeared.

Atherina hepsetoides is probably a *Taeniomembras*.

- „ *presbyteroides* I have so far failed to identify.
- „ *jacksoniana* is South American, not Australian.
- „ *hepsetus*: Australian records refer to *hepsetoides*.
- „ *endrachtensis* is a *Pranesus*.
- „ *elongata* = *Taeniomembras elongata*.
- „ *dannevigi* = *Atherinason dannevigi*.
- „ *mugiloides* = *Allanetta punctata*.
- „ *tamarensis* = *Taeniomembras tamarensis*.
- „ *microstoma* = *Atherinosoma microstoma*.

Atherinosoma microstoma lincolnensis Whitley, *Aust. Zool.*, x, 1941, p. 17, from Port

Lincoln, South Australia, to be added here.

„ *vorax* stands.

Pranesella endorae Whitley, *Vict. Nat.*, I (10), 1934, p. 241, fig. from Victoria to be added here.

Atherion maccullochi Jordan & Hubbs, 1919, recorded from the Great Barrier Reef, to be added.

* References: P. Augé, *Larousse du xx^e Siècle*, i, 1928, p. 301. G. P. Whitley, "Some Early Naturalists and Collectors in Australia", *J. Roy. Aust. Hist. Soc.*, xix, 1933, p. 310. Oliver, *The Life of Philibert Commerson*, 1909, p. 210. Havard and Havard, *J. Roy. Aust. Hist. Soc.*, xxiv, 1938, p. 17. A. Musgrave, *Bibliography of Australian Entomology*, 1932, pp. 99, 262; and the accounts of the "*Uranie*" voyage by Freycinet, Arago, W. Smith, etc.

† Professor Hubbs and I may prepare a joint paper on this aspect in due course.

Hepsetia edeleensis appears to be a *Craterocephalus*.

„ *lacunosa* = *Pranesus lacunosus*.

„ *pinguis* = *Pranesus ogilbyi*, but the "synonym" *modestus* is an *Atherinosoma* = *esox* Klz.

Craterocephalus spp. These probably stand, but *C. esox* should be transferred to *Atherinosoma*.

Iso rhotophilus stands.

Some new species and subspecies remain to be described.

Family LETHRINIDAE.

Genus LETHRINUS Cuvier, 1829.

LETHRINUS GLYPHODON Gunther, 1859.

D.x, 9; A.iii, 8; L. lat. 47. Predorsal 9 or 10. Tr. 6/1/17.

Head (69.5 mm.) 2.9, depth (76) 2.5 in standard length (204) or 3 in length to end of middle caudal rays (240).

Eye (16) 4.3 in head, interorbital, 18 mm. Snout, 35, including upper lip, or 30 without. Depth of caudal peduncle, 23.

Preorbital higher than long. Interorbital very slightly convex.

Upper maxillary (sheathed) reaching to about below posterior nostril.

Mouth reaching to under anterior nostril.

Canines moderate, four enlarged anteriorly in upper jaw; two in lower. A villiform band behind canines. Molars large, uniserial; three anterior lateral teeth more conical.

Dental formula:
$$\frac{5+3. \quad 4. \quad 3+5}{10.1.1. \quad 0. \quad 1. \quad 1. \quad (3+7)}$$

Fourth to sixth dorsal spines longest (23 mm.), one-third head. Sixth dorsal ray longest (30). Third anal spine, 21. Pectoral (65 mm.) reaches beyond level of origin of anal fin. Ventrals (45) reach vent, their spines rather compressed.

Caudal emarginate.

Colour, in formalin, olivaceous. Large blackish blotch (abnormal?) over pectoral fin. Many scales with lighter centres.

Described from a specimen 255 mm. or about 10 in. in total length.

Locality.—Cockle Bay, Townsville, Queensland. (George Coates.) Queensland Museum, No. 7545. Coll. No. 32.

Typical *L. glyphodon* Gunther has head $3\frac{1}{2}$ in total length; this is about 3.6 in same.

Typical *L. glyphodon* Gunther has eye 5 in head; this is about 4.3 in same; Gunther's type has pectoral longer and ventrals with rounded spines, whilst this has ventrals with compressed spines. These discrepancies are ascribed to variation.

LETHRINUS FLETUS, n. sp.

Emperor Bream, Coral Bream, Red Throat, Sweetlips.

Lethrinus haematopterus of Australian authors, not true *L. haematopterus* Temminck and Schlegel, 1844, from Japan.

D.x, 9; A.iii, 8; P.i, 12; V.ii, 5; C. 15.

Head (100 mm.) 2.8, depth (116) 2.4 in standard length (287), L. lat. 47. Tr. 6/1/17. 6 predorsal scales. 3rd dorsal spine longest. Pectoral 89 mm. Depth of caudal peduncle (34) 8.4 in standard length. Maxillary sheathed by preorbital, exposed part reaching below anterior nostril. Upper jaw: 4 canines anteriorly, followed by villiform teeth; about 8 molars, uniserial. Lower jaw: 4 canines anteriorly followed by villiform patch. About 10 molars, uniserial; 4 enlarged.

Life colour.—Generally grey above changing to white on ventral surface. Temples to side of head bronze, about 7 milky bands joining eyes; about 6 blue lines or short bars radiating from lower half of eye; cheeks and snout with pale blue to milky brown spots; upper lip pinkish-grey, lower white; upper lip orange posteriorly. Inside of mouth and throat the colour of red ink, sharply marked off from the flesh-white palate. Each scale of back and flanks has a dark brownish-grey central blotch; outer edge of scales greyish, so as to form alternating grey and pearly bands following contour of back. Dorsal pale smoky brown with pearly nebulous blotches, spines and tips of

membranes pinkish, rays with about three brown spots. Anal similar but paler. Pectoral hyaline, first ray blue superiorly; brown blotch on pectoral base. Ventral whitish, spine and first ray pale blue; pale burgundy near tips of other rays. Caudal pale burgundy; eye chestnut-brown and greyish. Some examples (usually small specimens) sometimes with a blackish shoulder blotch over middle of pectoral fin.

Described from a specimen 14 in. long.

Locality.—Off Stradbroke Island, Queensland; 4th March, 1943; coll. G. P. Whitley.

The holotype of this species is a smaller example (Australian Museum Regd. No. IA. 2579) from the Sir Edward Pellew Islands, Gulf of Carpentaria, Northern Territory of Australia (W. E. Paradise).

Genus *MONOTAXIS* Raffles, 1830.

MONOTAXIS AFFINIS, n. sp. Fig. 12.

Br. 6. D.x, 10; A.iii, 10; P.i, 13; V.i, 5; C. 15 branched rays. Gill-rakers 5 on lower part of 1st branchial arch. L. lat. 50 to hypural + 1 or 2 on base of tail. L. tr. 5/1/16 or 4½/1/5½ on caudal peduncle. Predorsal 7.

Head (102 mm.) 2.8, depth (123) nearly 2.4 in standard length (295). Eye (30) 3.4, interorbital (34) 3.0, snout (43.5) 2.3, and preorbital (34) 3.0 in head. Postorbital part of head, 25 mm.

Pectoral, 83 mm. Ventral 74. Longest (4th) dorsal spine, 33; longest (5th) dorsal ray, 51; third anal spine, 30; fourth anal ray, 46; upper caudal lobe, 69. Depth of caudal peduncle, 35.

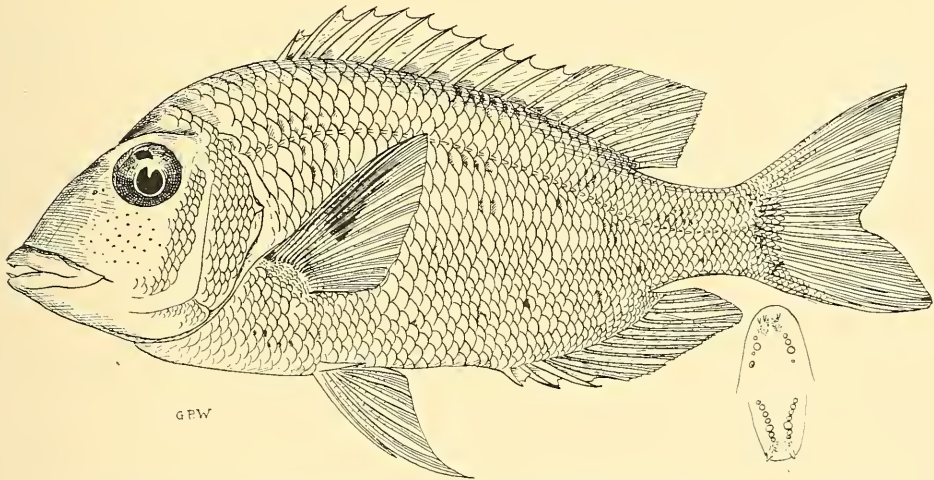


Fig. 12.—*Monotaxis affinis* Whitley. Holotype from Fraser Island, Queensland. Also teeth in upper and lower jaws.

Profile of head steep, tumid before and above the very large eyes. Snout longer than eye. Nuchal ridge intruding over the flat interorbital. No suborbital spine. Nostrils small. Three to four rows of scales on posterior quarter of cheeks; preopercular margin naked and entire, perhaps due to obsolescence of juvenile denticulations. Opercles scaly. A blunt opercular spine. Vertex of head, preorbital, suborbital, jaws and chin naked. Scales beginning on occiput with two rows of supra-temporal scales, widely separated from their fellows of the other side and, by a narrow naked interspace, from the body-scales behind.

Lips thick, subequal. Maxillary not reaching below eye, its posterior part slipping under preorbital; no ridge or spines on maxillary.

One or two small canines followed by a patch of villiform teeth on each side of upper symphysis. Three subcircular molars along each side of upper jaw, increasing in size backwards, and one or two very small molars behind there.

A large canine on each side of lower symphysis, with patches of coarse villiform teeth and seven lateral molars in lower jaw. Molars not grooved. Palate edentulous.

Gill-rakers few, knob-like, five on lower part of first branchial arch. Pseudo-branchiae small. Body compressed, ovoid, covered with large scales, which extend along caudal membranes but not on any of the other fins. They are almost smooth edged or very weakly ctenoid. Vent slightly in advance of anal fin.

Spinous dorsal longer and lower than soft. Last dorsal and anal rays divided to base. Dorsal spines slender, the first more than half the second. Anal similar to second dorsal but lower. Pectorals pointed, shorter than head. Pectorals and ventrals with enlarged axillary scales. Ventrals pointed, reaching first anal spine. Caudal forked, edges of lobes convex.

Colour, after preservation in formalin, brownish; many scales with greyish centres; purplish-brown along dorsal surface; some purplish-brown blotches (one or two scale-rows wide) on flanks and dark spots below pectorals. Fins greyish-brown; more or less dusky; proximal parts of dorsal membranes notably so; posterior parts of soft dorsal, anal, pectorals and ventrals whitish. Pectoral axil dusky. Hind margins of caudal light greyish. Eye bluish, with a dusky brown blotch superiorly. No light areas on head posteriorly. Numerous small dark spots on preorbital.

Described (and figured) from the unique holotype, a specimen 295 mm. in standard length or $14\frac{1}{2}$ in. overall.

Locality.—North Gardiner Bank, off Fraser Island, Queensland; M.V. "Warreen", September, 1938. Queensland Museum Regd. No. I. 6609.

This species differs from *Monotaxis grandoculis* in the form of the molar teeth, which are small, stud-like and circular, more as in some *Lethrinus*, instead of being broad, almost quadrangular, and flattened.

Monotaxis grandoculis has been well described and figured by Weber and de Beaufort (*Fish. Indo-Aust. Archip.*, vii, 1936, p. 350, fig. 73) and can be distinguished from the species described above as follows:

M. grandoculis
(and its synonyms).

Six canines in upper jaw and four, subequal to them, in lower jaw, anteriorly. About six or seven large, oval, flat molars laterally in each jaw.

L. lat. 47.

Predorsal scales 9-10.

Pectorals as long as head.

M. affinis, n. sp.

Three canines in upper jaw and two larger ones in lower. About three sub-circular, small molars laterally in upper and seven in lower jaw.

L. lat. 50.

Predorsal scales 7.

Pectorals shorter than head.

Other differences in proportions of head, and coloration as described above. The dorsal profile of the new fish is more humped anteriorly than in the examples figured by Weber and de Beaufort, Bleeker, Rüppell, and others.

This novelty has a striking superficial resemblance to *Paradentex bitorquatus* (Cockerell, 1916), but differs in having molars instead of conic lateral teeth (compare J. L. B. Smith, *Trans. Roy. Soc. S. Afr.*, xxviii, 1941, pp. 441-450, and Whitley, *Mem. Qd. Mus.*, xi, 1936, pp. 26-29).

FAMILY GOBIESOCIDAE.

Genus LEPADICHTHYS Waite, 1904.

LEPADICHTHYS SANDARACATUS, n. sp.

Head broad and depressed, without apparent opercular spine. Lips thick and flattened. A single series of incisor teeth in each jaw, the cutting edge crenate in upper jaw and more pointed in lower jaw. Palate edentulous. Tongue acute, with round tip. Mouth not reaching back to eye. Anterior nostril with raised tube, posterior pore-like, both near top of eye anteriorly. Three gill-arches. Gill-openings wide, separated by a broad isthmus. Branchiostegals flattened.

Length of head (10.5 mm.) 3.7, its width (7) 5.5, depth of body (6) equal to its width (6) 6.5 in total length (39). Snout (4) 2.6 in head. Eye little more than 2 mm. in horizontal diameter, little less in vertical diameter, about half the interorbital (4), which is flat. Adhesive apparatus 5.5 mm. long; longer than broad. Length of pectoral, 4.5, of caudal, 5.1; depth of caudal peduncle, nearly 4 mm.

Body depressed anteriorly, compressed posteriorly, naked, muciferous. Peritoneum light. Vertebrae 15 + 18 = 33. Vent nearer anal origin than posterior margin of sucker. A groove along the belly, present in some specimens, may be due to preservative.

Dorsal and anal fins long, united by membrane to anterior part of the rounded caudal. Fourteen dorsal and ten or eleven anal rays. Caudal fin rounded. About 15 caudal rays. Pectoral with about 18 rays above a membrane attaching them to ventrals, then with lowermost seven rays or so going below sucker.

Ventrals with four main rays, flattened to form part of sucker. Sucking disc, more or less papillate, with free margin posteriorly fringed. Anterior edge joining ventrals also free.

Colour uniform yellowish or (in the holotype) carmine, in alcohol. No black stripe through eye.

Described from the holotype (Australian Museum Regd. No. IB. 307) and five paratypes (IB. 308, 309, 354 to 356), 31.5 to 41 mm. in total length.

Locality.—Useless Inlet, Shark's Bay, Western Australia; dredged in June–July, 1939. G. P. Whitley. The Australian Museum has also another example (I.13269) from "West Australia", received in 1914.

Differs from the Lord Howe Island genotype, *Lepadichthys frenatus* Waite, in fins and vertebral counts and in having a free margin to the sucking disc posteriorly, otherwise the essential characters are as described and figured by Waite (*Rec. Aust. Mus.*, v, 1904, p. 180, pl. xxiv, fig. 2).

Genus VOLGIOLUS Whitley, 1931.

VOLGIOLUS INTERORBITALIS, n. sp.

Head broad and depressed, without apparent opercular spine, its length (8 mm.) 2.6, its width (6) 3.5 in standard length (21) or about 3.6 and 4.8 in total length respectively (estimated since end of tail is broken). Depth of body (4) less than greatest width (5.5), near preoperculum.

Snout much narrower than posterior part of head, its breadth (2.5 mm.), more than its length (2.1). Small cardiform teeth in each jaw. Mouth reaching back to below eye. Nostrils with small flaps and rims. Eye (2 mm.) little longer than the flat interorbital breadth (1.6).

Gill-membranes free across isthmus. Three gill-arches.

Body depressed anteriorly, compressed posteriorly, naked. Adhesive disc free anteriorly and posteriorly on both its portions, not noticeably papillated, its anterior margin slightly behind level of posterior margin of eye. The apparatus is 5 mm. long, and is longer than broad.

Vent midway between anal fin and adhesive disc. D.9; A.7; V.4. Horizontal distance between termination of dorsal and base of median caudal rays much less than total base of dorsal. Dorsal and anal fins not joined to caudal base. Anal originating slightly behind level of dorsal origin. Pectoral about 3 mm. long; caudal, 4.2; depth of caudal peduncle 2.1.

Colour (in alcohol) uniform yellowish-brown in the holotype, blotched with carmine in the paratype; sides with few spaced minute brown speckles. Eyes blue.

Described from two specimens, 20–21 mm. in standard length, or nearly 1 in. overall. Australian Museum Regd. No. IA. 677.

Locality.—Albany, King George's Sound, Western Australia; collected by Messrs. E. Troughton, H. Grant and J. H. Wright, 1921.

V. costatus has eye less than interorbital, adhesive apparatus more papillate; *V. cardinalis* has broader and more muscular adhesive apparatus, eyes much less than interorbital, and larger teeth.

The new species also differs from its congeners in the relative positions of the origins of the dorsal and anal fins and the situation of the vent.

COCHLEOCEPS, n. gen.

Orthotype, *Crepidogaster spatula* Gunther (*Cat. Fish. Brit. Mus.*, iii, 1861, p. 508, from Swan River, W. Australia) = *Cochleocephalus spatula*.

The type-species of *Crepidogaster* Gunther, 1861, preoccupied = *Aspasmogaster* Waite, 1907, is *A. tasmaniensis* (Gunther), which has recently been figured by Scott (*Proc. Roy. Soc. Tasm.*, 1935 (1936), p. 120, fig. 2).

Gunther's '*Crepidogaster*' *spatula*, which has been figured by Waite (*Rec. Aust. Mus.*, vi, 1906, p. 201, pl. xxxvi, fig. 4—not 2 as in 'explanation') from a Victorian specimen, differs in having a very much shorter dorsal fin, quite distinct from the caudal, with 6 or 7 rays instead of 8 to 10. It is evident that *spatula* should be separated as a distinct genus, characterized further by the lower coracoid extension and the broad, long, depressed snout.

Family ELEOTRIDAE.

Genus *EVIOTA* Jenkins, 1903.

EVIOTA VIRIDIS INUTILIS, n. subsp.

Br. 5. D.vi/i, 10; A.i, 8; P. 15 to 17; V.i, 4; C. 13 main rays. Sc. 19 to 26. Tr. about 7.

Head (5.1 mm.) 4.7, depth of body (4.1) 6 in total length (24). Eye (2) twice as long as snout (1). Depth of caudal peduncle, 3 mm. Predorsal length (7) 2.6 in standard length (19.5).

Head rather rounded, naked. Eyes large. Interorbital a narrow groove between orbital rims. Lips thick, mouth oblique, reaching to below middle of eye. Minute canines, largest anteriorly, in each jaw, the largest pair being behind symphysis of lower jaw. A broad velum above and below. Tongue rounded. Several large pores around top of eyes and along top of gill-covers. Nostrils with tape-like flaps. Opercles without spines. Gill-membranes joined to a rather narrow isthmus. Gill-rakers short and blunt, seven on lower part of first branchial arch. Skull without distinct median keel.

Body oblong and very compressed, covered with large round ciliated scales, longitudinally striated proximally, which do not extend forward of pectoral base. Belly with more or less distinct grooves above ventral fins.

A bifurcate genital papilla. Nine blackish cross-bands in the median (interior) line of the fish. Vertebrae 10 + 15 = 25.

First dorsal spine longest, or slightly produced. Second dorsal fin larger than anal. Pectorals irregularly rounded, the lower rays branched and feather-like; no free rays. Ventrals separate, with small weak spine, all the rays very fringed and feather-like, the fourth longest. Caudal rounded, longer than depth of body.

Colour in spirit brownish, with colour markings formed by clusters of blackish chromatophores at various layers. The sides and top of the head with large round spots, darkest along top of gill-chamber. Body with subvertical rows of dots, corresponding to each scale. Paired fins plain, others spotted or infuscated. Chin plain or spotted. Dark marks at base of each ventral fin. Six or seven dark spots between anal origin and caudal on lower surface of body. Sometimes two dark blotches on pectoral base and another before base of caudal. Eye dark bluish. Ends of nostril flaps blackish.

Described from the holotype and paratypes, a series of seven specimens, 22 to 27 mm. in total length. Australian Museum Regd. Nos. IB. 330 to 336.

Locality.—Head of Useless Inlet, Shark's Bay, Western Australia; amongst material brought up by pearl oyster dredge, 2nd July, 1939; G. P. Whitley.

Very close to *Allogobius viridis* Waite (*Rec. Aust. Mus.*, v, 1904, p. 177, pl. xxiii, fig. 3) from Lord Howe Island, and *Eviota zonura* Jordan and Seale (*Bull. U.S. Bur. Fish.*, xxv (1905) 1906, p. 386, fig. 75) from Samoa, but differing in proportions and colour markings.

Family GOBIIDAE s.l.

Genus *AUSTROLETHOPS* Whitley, 1935.

AUSTROLETHOPS WARDI Whitley, 1935.

Austrolethops wardi Whitley, *Rec. Aust. Mus.*, xix, 1935, p. 243, fig. 10. Lindeman I., Queensland.

This species, known hitherto only from the type in the Australian Museum, has evaded capture since it was described, although Mr. M. Ward and I searched assiduously for it around the type-locality. When at the Queensland Museum recently, however,

I found two more specimens which had been labelled under a new generic and specific name by McCulloch and Ogilby, who, unfortunately, never published any description of this rarity.

One specimen (Queensland Museum Regd. No. I. 3049) was collected about 1918 in Moreton Bay by Miss Kate Thynne; it is 70 mm. in standard length or $3\frac{1}{2}$ in. overall, and is thus the largest known specimen, and Moreton Bay is the southernmost limit of distribution. The second specimen (I. 7400) is $2\frac{3}{8}$ in. in total length and was dredged at Mud Island, Moreton Bay, Queensland.

Family BALISTIDAE.

Genus SUFFLAMEN Jordan, 1916.

SUFFLAMEN FRAENATUS (Latreille, 1804).

Balistes fraenatus Latreille, *Nouv. Dict. Hist. Nat.*, xxiv, 1804, Poiss, p. 74. No loc.

Sufflamen fraenatus Whitley, *Mem. Qd. Mus.*, xi, 1937, p. 146 (references and synonymy).

D.iii/30; A. 27; P. 14; V.i (movable); C. 10 main rays. Sc. 55 to hypural. Six rows of keels along caudal peduncle. Teeth not fused. Eye small, interorbital convex. Preocular groove long. Anterior (lower) part of gill-opening below pupil. Four enlarged suprapectoral scales. Body-scales diamond-shaped with regular small bosses, separated by criss-cross paths. About 27 scales between origins of second dorsal and anal fins. First dorsal spine large, strongly compressed. Caudal margin bisinuate. Caudal peduncle O-shaped in cross-section.

Length to end of middle caudal rays, 346 mm. Predorsal, 124. Head, 97. Depth at second dorsal and anal origins, 124; depth of caudal peduncle, 24. Middle caudal ray, 37. Eye, 14. Preocular, 80. Interorbital, 28. Gill-opening, 39. First dorsal spine, 46. Base of second dorsal fin, 100.5; of anal fin, 90.5. Pectoral, 29.

Life-colours changing. Ground-colour pale greyish or olivaceous or dark olive-greenish on most of head and body. Iris golden; dull honey-brown above. Teeth white. Upper lip dirty pinkish; lower half of lower lip bright yellow. A dirty whitish ring around the mouth. Chin and breast dull brownish-grey; a light pinkish-white band crosses chin. An oblique white band from near upper lip to nearly below gill-opening (at times, these white bands become salmon-pink; a second specimen lacked this oblique band and had very pale chin-band). First dorsal fin rich dark brown. Second dorsal and anal fins olive-green with broad smoky grey area proximally and narrow light grey margins. Pectorals pale olive to greyish. Pubic spine and ridge bluish-grey. Caudal fin very dark olive.

Several specimens were hooked west of Sandy Cape, Fraser Island, Queensland, on 13th March, 1943, the fish making a curious "burping" noise with mouth or gills.

Family TETRAODONTIDAE.

Genus CHELONODON Mueller, 1841.

CHELONODON DAPSILIS, n. sp.

D.i, 9; A.i, 7; P.i, 15; V.0; C.8 main rays.

Normal depth equal to head (18 mm.), 2.5 in standard length (46). Eye (6) 3, interocular (13) 1.3, snout (10) 1.8 in head. Depth of caudal peduncle, 5.5 mm. Gill-slit, 5; length of pectoral, 7.5; dorsal, 7.6; anal, 9; caudal, 13 mm.

General form pear-shaped, without keels. Lips fimbriate. Four yellowish teeth, forming a beak. Nostrils a small lanceolate anterior and a broad leaf-like posterior flap, not in a papilla or tube. Eyes rather large, oval, united with surrounding skin. Integument mostly smooth to the touch, minutely papillated and with scattered weak spines across back, over pectorals and on all extensible ventral surface from behind anterior level of eyes. Gill-slit and flange entire, without processes or cartilaginous spur.

Lateral line faint, curving in a broad sweep from above pectoral fin to descend below dorsal to above end of anal, it swerves up and then down before reaching the tail. Branches of the l. lat. surround each eye, pass the nostril to near the mouth, and bend back along ventral surface to meet the opercular canal; another branch crosses the snout before nostrils. No scale-like structures. Vent slightly before anal fin, its skin convoluted.

Fins all with rounded tips. Origin of anal slightly behind that of dorsal. Third or fourth pectoral ray longest. Caudal truncate.

Colours in life: Eyes yellow and orange. Back mottled light and dark grey. Belly white. A prominent yellow patch below pectoral fins. Fins plain except for dark grey blotch on caudal. No black spot at vent.

After preservation in formalin and transference to alcohol, the yellow patch has vanished and the eyes became blue. The darker grey of the back and sides tends to form cross-bands, one between eyes, the second behind pectoral bases, and the third below dorsal fin, forming dark blotch on each side; there is a trace of a fourth dusky cross-band before root of tail. Light oval areas along sides of back posteriorly. Nostrils and mouth light.

Described from the holotype (Australian Museum Regd. No. IB.1261) and two small paratypes (IB.1262-3), 36 to 46 mm. in standard length, or up to about $2\frac{3}{8}$ in. overall.

Locality.—Near Mackenzie Island, Fitzroy River estuary, Queensland; bait net haul over muddy shallows, 19th March, 1943; coll. G. P. Whitley.

Nearest *Tetrodon patoca* Hamilton-Buchanan, 1822, from the Ganges, but differs from that species in fin-formulae, colours, shorter dorsal base, etc.

OMEGOPHORA ARMILLA (McCulloch & Waite, 1915).

Numerous specimens at Queenscliff, Victoria, in February and March, 1942.

Colour of back pale brown; dark greyish-brown on sides of face. Lips white. Nostrils, sides of body, and fins bright yellow. Pupil blue, iris bright yellow. Lower half of caudal with dark grey blotch distally. Mark around gill and pectoral black. Belly white.

D. 12. A. 11. C. 8 (6 branched). Total length 132 mm.

New record for Victoria.
